Integrating Environmental Education in the Life Sciences curriculum in the Vhembe District, Limpopo

By

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I declare that this dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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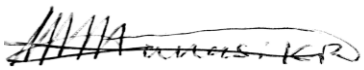
I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.



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SIGNATURE DATE

DEDICATION

I dedicate this work to my late grandfather, Mr Shonisani Joseph Munasi. May his soul rest in peace.

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ABSTRACT

The mandate from the government is for schools to integrate Environment Education (EE) in all subjects. However, some Life Sciences teachers in the Vhembe District still fail to integrate EE into their lessons. This qualitative case study, hence, investigated how Life Sciences teachers in Vhembe District of Limpopo Province are supported by the Department of Basic Education (DBE) to integrate EE into their lessons. The purpose of this study was to develop guidelines to enhance the support given by DBE, to Life Sciences teachers, in their attempts to integrate EE into their lessons.

Studies have been conducted about factors that inhibit the integration of EE in school subjects. However, little has been written about how the DBE supports teachers to integrate EE in their lessons. This study contributes knowledge to this gap. This study was based on interpretivism, followed a qualitative approach and a phenomenological case study design. Three schools in Vhembe District in Limpopo Province were conveniently selected and one Life Sciences teacher was purposively selected from each school to get rich-information about the research topic. One subject advisor was also purposely selected as a participant from the Vhembe District under, Mutshindudi circuit. Data were collected through semi-structured face-to-face interviews with the teachers and the subject advisor. Before the interviews, the Curriculum and Assessment Policy Statement (CAPS) document, pacesetter and textbooks were first analysed.

Findings from the CAPS document analysis show support for teachers towards integrating EE in Life Sciences, although, the pacesetter does not provide such support. The teachers, however, do not take advantage of the offered support from the documents because they do not read these curriculum documents. Further, the findings reveal that the subject advisor was not doing enough to support the teachers as the limited support that the teachers received was only reactive. This study also found that lack of training for teachers and the subject advisor, lack of understanding of EE and lack of resources were still challenges in the integration of EE in the research context.

This study recommends that there should be a more proactive support for to integrate EE into their lessons so as to produce environmentally informed learners. Thus, the DBE must take responsibility of providing teachers with necessary trainings and resources for EE to support them to integrate it into the lessons.

Key words

Environment; Environmental Education; Curriculum; integration; Life Sciences; Curriculum Assessment Policy Statement; textbooks; support; Life Sciences teachers; Subject advisor; Sustainable Development; Education for Sustainable Development.

Contents

LIST OF ABBREVIATIONS

ANC	African National Congress
BC	Before Christ
CAPS	Curriculum and Assessment Policy Statement
CEE	Council for Environmental Education
DBE	Department of Basic Education
DEFSD	Decade of Education for Sustainable Development
EE	Environmental Education
EEASA	Environmental Education Association of South African
EECI	Environmental Education Curriculum initiative
EEPI	Environmental Education Policy Initiative
ESD	Education for Sustainable development
FET	Further Educational Training
GET	General Education and Training
GET-FET	General Education and Training - Further Education Training
IUCN	International Union for the Conservation of Nature and Natural resources
KZN	KwaZulu Natal
NEAC	National Environmental Awareness Council
NECC	National Education Coordination Committee
NEEP-GET	National Environmental Education Project for General Education and Training
NGO	Non-Governmental Organisation
OBE	Outcome-Based Education
PCK	Pedagogical Content Knowledge
SDGs	Sustainable Development Goals
UN	United Nations
UNEP	United Nation Environmental programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation

UNISA	University of South Africa
USA	United States of America
USSR	Union of Soviet Socialist Republic
UVP	Umgeni Valley Project
WCED	World Commission on Environment and Development
WSSD	World Summit for Sustainable Development
WWF	Wildlife and the Wildlife Fund

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CHAPTER 1: INTRODUCTION TO THE STUDY

1.1 Study Background

The changes that took place in the South African school curriculum after 1994 brought about the introduction of Outcome-Based Education (OBE) (Tshiredo, 2011:1). Over the years since then, the education curriculum has been constantly revised, such that presently the Curriculum and Assessment Policy Statement (CAPS) has been followed since 2011. The changes that have been instituted in the curriculum saw the adoption of new themes into the curriculum. A call for the integration of Environmental Education (EE) as one of the themes across the school curriculum was made. Before 1994, EE in South Africa took place in the non-formal education sectors for many years, however, after 1994, a requirement for implementing EE in all subjects was stated in the Environmental Education Policy Initiative (EEPI, 1995; Loubser, De Beer, Dreyer, Hattingh, Irwin, Le Grange, Le Roux, Lotz-Sisitka & Schulze, 2014:145)). As a result, "EE processes are now integral to all subjects in the formal curriculum" (Loubser et al., 2014:59), however, most researchers, internationally, have investigated the integration of EE in school subjects and found that teachers do not integrate EE into their lessons because they lack the necessary knowledge and skills. From her research that was conducted in New Zealand, Bolstad (2004) discovered that even though EE is integral to school curriculum, teachers still lack skills and knowledge to teach EE in their subjects. Palmer and Neal (1994) also argue that the successful implementation of EE relates to teachers' subject knowledge, skills and dedication to this aspect of their teaching. This shows that teachers need to have adequate EE skills and knowledge in order to implement effective integration of EE into their lessons.

This study analysed the way in which the Department of Basic Education (DBE) supports teachers to integrate EE in the lessons of Life Sciences in secondary schools in Vhembe District, South Africa. The study was premised on the notion that for an effective implementation of any policy related to teaching and learning, there must be systematic interactions between teachers and the DBE, wherein the teachers identify and raise their concerns and challenges, and in turn, they receive some form of guidance from the DBE. Such identification of challenges and interventions could also be triggered by the initiative from the subject advisors. A subject advisor is a person who is a specialist in a particular subject who supports school teachers by developing and improving the instructional material for the subject. Crucial questions at this point are whether teachers who struggle to integrate EE in their subjects received any support from the Ministry, particularly from the EE specialists, and if they did, how they percieve such guidance. The assumption was that

the findings from this study would shed light on how the DBE could improve on the intervention strategies to support Life Sciences teachers who faced problems in integrating EE.

The EE curriculum policy development was given a refocus during the revision of curriculum 2005 and the development of national curriculum statement for general education (Loubser *et al.,* 2014:59). In June 2000, "the council of education ministers noted that EE should receive special attention in revision of the national curriculum" (Loubser *et al.,* 2014:59). The revision of the national curriculum resulted in EE processes being integral to all the subjects in the formal curriculum. Schudel, Le Roux and Sisistka (2008) argue that despite the fact that various environmental conferences and seminars on the implementation of EE in schools are being conducted, teachers are not receiving relevant training that helps them to implement EE into their lessons from the provincial departments of education. According to research conducted by Nhlongo (2015), different workshops and training conducted on EE failed to equip teachers with the necessary skills to implement EE effectively. This situation, therefore, leaves most teachers lacking skills and experience of integrating EE, especially, whenever the curriculum transforms. It was, hence, necessary to investigate whether there have been any developments in relation to the way the DBE support teachers to implement EE in their teaching practices.

One of the reasons behind integrating EE with all school subjects was to create a society with individuals who are well-equipped with the right environmental knowledge, skills, value and attitudes to face current environmental problems and those that they might face in their everyday life (Loubser *et al.,* 2014:157). Nevertheless, most teachers do not integrate EE in their lessons (Zwelibanzi, 2016). The teachers' lack of EE integration inhibits the possibility of developing individuals who can take care of their environment, sustainably (Kimaryo, 2011:18). The underlying aim of EE is to enable learners in schools to learn about their environment, solve problems that their environment faces and learn about the ways in which they can preserve their environment for the future generation (United Republic of Tanzania, 2004). When most teachers fail to integrate EE within their subjects, it inhabits EE from achieving this aim.

In the process of my reading towards this study, the researcher found that the problems about EE integration in the school curriculum are not experienced only in South Africa. For example, in her study, Kimaryo (2011) argues that the Education and Training Policy of 1995 emphasised that, from the 1960s, in Tanzania, the conditions of the environment have not improved, regardless of EE been included in the school curriculum. She further states

that the results from studies conducted lately show that “the implementation of EE has not been successful”. Countries, such as Botswana and Zimbabwe face the same problem, as integration of EE into the curriculum faces implementation challenges in secondary schools (Kimaryo (2011). Similarly, Van Petegem, Blieck and Van ongevalle (2007) found that in Zimbabwe, teachers only appreciate EE, but they find it difficult to teach it because they cannot integrate EE with their subject content.

These studies reflect that the problem that South Africa faces of teachers not integrating EE in their subjects is a global problem that needs attention. Teachers appreciate the need to integrate EE across the school curriculum, but most of them do not implement it. This poses a problem because schools are likely to produce children that are environmentally illiterate and who, therefore, cannot take care of their environment due to the fact that EE was not integrated in the subjects they learnt. The South African DBE needs to attend to the problem of teachers failing to integrate EE in their lessons as this will ensure it can serve its purpose of imparting leaners with skill of dealing with environmental problems that they might face.

1.2 **Motivation of the study**

A number of issues related to the researchers personal experiences and also observation of existing conditions related to EE in the rural secondary schools of Vhembe District motivated this study. First, as a Life Sciences teacher, I had seen most of my colleagues facing challenges to integrate EE in their teaching. In the school where I teach, teachers complain about having limited training towards the integration of EE in their lessons, showing that they lacked the necessary skills. This situation raised my interest to investigate how teachers in other schools were doing and what kind of support they receive from the DBE, with regard to the integration of EE into their lessons.

Secondly, I found literature suggesting that teachers’ training in EE helps to increase their environmental knowledge only but not the translation of this knowledge to actual teaching practice (Kanene 2016:3). The researcher was interested, thus in analysing the relationship between this statement and the failure of teachers to integrate EE in Life Sciences, in the secondary schools of Vhembe District.

1.3 **Problem statement**

As alluded to in the introduction and the background sections above, EE has an important role of developing citizens that can manage their environment, sustainably (Kimaryo, 2011:16). Schools can play a crucial role in facilitating the achievement of this role,

however, as indicated, teachers are not supporting much towards seeing the achievement of this goal because they lack appropriate skills and knowledge of integrating EE into their lessons. The notion on which this study is premised is that, the DBE should take actions to intervene in this regard. While research has reported on the teachers' difficulties regarding the integration of EE into their lessons, little has been written about how the DBE supports teachers who have difficulties in integrating EE in various subjects in places like the Vhembe Distict. This study intends, therefore, to contribute towards filling in this knowledge gap.

1.4 Research questions

The main research question of this study is:

How are Life Sciences teachers in the Vhembe District of Limpopo Province supported by the Department of Basic Education to integrate EE in their lessons?

This research question is divided into the following sub-questions:

- How do the subject policy document, textbooks and pacesetters that are supplied by the DBE guide Life Sciences teachers to integrate EE into their lessons?
- How do the subject advisors guide Life Sciences teachers in integrating EE with their lessons?
- How do Life Sciences teachers experience the strategies provided to support them to integrate EE into their lessons?
- What can be done to enhance the support given by the Department of Basic Education to Life Sciences teachers to integrate EE into their lessons?

1.5 Purpose of the study

The purpose of this study is to develop guidelines to enhance the support given by DBE to Life Sciences teachers to integrate EE into their lessons.

1.6 Aim of the study

The aim of this study is to explore how Life Sciences teachers in the Vhembe District of Limpopo Province are supported by the DBE to integrate EE in their lessons.

1.7 Objectives of the study

The following are the objectives of this study:

- To identify how the policy document, books and pacesetter that are supplied by the DBE, guide Life Sciences teachers to integrate EE in their lessons.

- ❖ To examine the manner in which subject advisors guide Life Sciences teachers in integrating EE in their lessons.
- ❖ To understand how Life Sciences teachers experience the strategies provided to support them to integrate EE.
- ❖ To explore the possible strategies that can be used to enhance the support given by the DBE to Life Sciences teachers, to integrate EE into their lessons.

1.8 Rationale for the study

Environmental Education (EE) is important for both people and the environment. As will be discussed in section 2.2.2 below, EE involves learning about, and for the environment. For example, Loubser *et al.,* (2014) indicated that EE unlocks creativity because it is more of hands-on in learning about the environment and this encourages learners to become more engaged in learning. Scholars, such as Mathenjwa (2014), however, have indicated that people in rural areas lack education about, and for the environment and as such they turn not to use the environment sustainably. For example, the Vhembe District (Limpopo province, in South Africa), is one of the areas that is rich in diversity of plants and animal species, unfortunately, some people display insensitivity, disrespect and lack of appreciation for the environment. There is a high rate of deforestation and veld burning in this area. Most plants and animal species are becoming extinct because of man-made activities. EE, thus, is important in Vhembe for the sake of the sustainability of plants and animal species which are necessary for the future generations. Teachers, hence, should be supported to ensure that they provide strong EE programmes in schools for such sustainability.

1.9 Delimitation of the study

This research focuses on the integration of EE in the secondary school curriculum in Mutshindudi circuit, Vhembe District, Limpopo Province and on one subject, Life Sciences, Grade 10-12. For this reason, this research was confined to only these teachers from three selected schools. Only one teacher per grade was selected, using purposeful sampling as indicated in the sampling section.

1.10 Definitions of Key concepts

This section provides definitions of key concepts as utilised in this study.

1.11.1 Environmental Education (EE)

The IUCN (1971) defines ‘EE’ as “a process of recognising values and clarifying concepts” that help to develop the skills that are needed to help individuals to understand their culture

and their biophysical surroundings. Similarly, Kimaryo (2011:16) states that EE helps impart skills and knowledge to individuals, so that they become “knowledgeable about their environment” ensuring that they are able to take care of it. EE involves active learning about environmental issues by “gaining knowledge about the environment” (Zwelibanzi, 2016). Once EE is learnt, one acquires a new perceptive about the environment and he/she is able to appreciate the environment.

1.11.2 Integration

According to Hughes’s (2004), Oxford Dictionary of English, integration implies combining one thing with another to form a whole. In this study, integration includes combining EE with Life Sciences curriculum, however, McNeil (1996), also defined ‘integration’ as a way to organise content. Integration calls for change in schools, which may involve re-looking at goals and purpose of learning outcomes or tasks that require the involvement of parents in classroom work and structures (McNeil, 1996).

1.11.3 Curriculum

Rampedi (2001:13), explains that a “curriculum is the planned experiences provided through instruction”. Orstens and Hunkins in Tshiredo (2013:5), add that a curriculum is a “plan of achieving goals”. These definitions indicate that curriculum is about a planned structure of what should be taught in schools.

1.11 Chapter outline

This thesis consists of the following chapters:

Chapter 1: Introduction to the study: This chapter provides a brief theoretical background and outline of the study. This includes the motivation, background, the purpose of the study, research problem, aims, objectives, and the definitions of key concepts.

Chapter 2: Literature review: This chapter contains the literature review and detailed theoretical background of the study.

Chapter 3: Research methodology: This chapter presents the research methodology of this study. It includes the research paradigm and approach, research design, sampling, data collection, as well as data analysis.

Chapter 4: Research findings: This chapter discusses the findings of the study.

Chapter 5: Discussion of findings, conclusions and recommendations: This chapter gives the summary of the findings, the recommendations and the conclusion of the study.

1.12 **Chapter Summary**

This chapter introduced and gave the background and motivation of the study. It outlined the problem statement, the research question and the sub-questions. The chapter also outlined the purpose, aim and objectives of the study, the research methodology of the study, highlighting the research paradigm and approach, research design, sampling methods, data collection method, and data analysis. In addition, trustworthiness, ethical consideration, limitation and delimitation are highlighted in this chapter. The chapter ends by providing layout of the chapters and the whole thesis.

CHAPTER 2: LITERATURE REVIEW

Chapter 1 introduced this study by outlining - the study background and motivation , together with the problem statement, research qouestion, purpose of the study, aim of the study, objectives of the study, rationale of the study, key concepts as well as the chapter outline. In this chapter, literature that was reviewed in relation to this study is presented. McMillan and Schumacher (2010) state that reviewing literature enables us to develop a link between a research problem being investigated and the existing knowledge about the topic. In response to this reason for literature review, this chapter presents three main sections. Firstly, it discusses the global and South African history of EE. Secondly, it outlines and discusses the EE and sustainable development, together with education for sustainable development. Thirdly, a discussion of the integration of EE in the international, African and South African school curriculum is provided. The theoretical framework that guides this study is also discussed in this chapter.

2.1 History of Environmental Education

In this section, the discussion focuses on the origin of EE, first from a global perspective and then a South African one.

2.1.1 The global history of Environmental Education

Loubser *et al.,* (2014) trace the origin of EE back to the ancient Egypt, Greece, India and China. These authors give examples of how the tenth Pharaoh of the eighteenth dynasty of Egypt taught farmers not to plant their crops in the vegetated Nile River banks in order to prevent soil erosion. This shows that people of Egypt have been practicing EE before the term, EE, was even established. Similarly, reforestation and sustainable production have been practiced in China for over 3000 years (Irwin & Lotz-sisistka, 2005). Concurringly, in Greece, Theophrastus, a student of Aristotle, was the first person to recognise the basic principles of ecology in the 4th century before Christ (BC), where he unsuccessfully argued for a form of integrated environmental management; he is considered the father of ecology (Melville, 2007).

In his 1762 novel, Jean-Jacques Rousseau commented that education should have a focus on the environment; he also helped in developing programmes, such as Nature of Study (UNESCO, 1978). It seems the statements of Rousseau in his novel have had some impact, because today our education system has placed some focus on the environment. Similarly, Louis Agassiz, a renowned scientist who was born in 1807, encouraged his learners to gain

their knowledge directly from nature not from books (Loubser *et al.,* 2014). Agassiz's arguments can be related to the present day perspective of education being inclusive of knowledge on the environment.

The first environmental organisations were formed soon after the end of World War II. Of the formed organisations was the International Union for the Conservation of Nature (ICUN), formed in 1948. In the following year, 1949, UNESCO formed a partnership with ICUN and together, they played a very significant role in making sure that EE was internationally accepted (Loubser *et al.,* 2014). During the late 1960s to early 1970s, the development of EE increased its momentum (Mathenjwa, 2014) and in 1972, EE reached its milestone after the United Nations conference on human environment, held in Stockholm. The United Nations Environment Programme (UNEP) was formed at this conference and it became the first UN agency with headquarters outside of Europe and North America (Loubser *et al.,* 2014). In 1975, UNESCO together with UNEP organised the first international workshop on EE in Belgrade Yugoslavia. Following the workshop, in 1977, the first intergovernmental conference of EE was held in Tbilisi in the republic of Georgia. During the conference, the aims, objectives and principles that should guide EE were developed and these are still used even today. Some of the developments that resulted from the conference were the 12 principles known as the *Tbilisi Principles of EE,* which clearly state that EE should (Loubser *et al.,* 2014:46):

- Consider the environment in its totality - natural and built, technological and social;
- Be a continuous lifelong process, beginning at the preschool level and continuing through all formal and non-formal stages;
- Be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
- Examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas
- Focus on the current and potential environmental situation while taking into account the historical perspective;
- Promote the value of, and the necessity for, local, national and international cooperation in the prevention and solution of environmental problems;
- Explicitly consider environmental aspects in plans for development growth;
- Enable learners to have a role in planning their learning experiences and provide opportunity for making decisions and accepting their consequences;

- ❖ Relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in the early years;
- ❖ Help learners discover the symptoms and real causes of environmental problems;
- ❖ Emphasise the complexity of environmental problems and, thus, the need to develop critical thinking and problem-solving skills; and
- ❖ Utilise diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment, with due stress on practical activities and first-hand experience.

Following the development of these principles, the 1980s saw the formation of a number of international commissions and compiling of reports that influenced people's view of the environment and EE (Loubser *et al.,* 2014). The Bruntland report about the World Commission on Environment and Development (WCED) entitled "*Our Common Future*" was one of the commissions that played the most influential role in the development of EE. Zwelibanzi (2016:44) added that the Bruntland report also played a developmental role in the idea of sustainable development in which "environmental protection and economic growth are viewed as interdependent concepts".

More EE forums continued developing with most by the Non-Governmental organisations (NGOs). Following that, in 1992, there was the earth summit that developed a treaty on EE for sustainable societies (Zwelibanzi, 2016). The 1992 earth summit was attended by the international forum of NGOs and social movements, and it was held in Rio de Janeiro, Brazil. The treaty designed during the summit developed the principles for equitable and sustainable societies, known as the *NGOs' Forum Principles*. Loubser *et al.,* (2014:49) identified the following as some of the principles of EE for equitable and sustainable societies:

- ❖ Education is the right of all; we are all learners and educators.
- ❖ Environmental education, whether formal, non-formal or informal, should be grounded, and innovative thinking should occur in any place or time, promoting the transformation and construction of society.
- ❖ Environmental education is both individual and collective. It aims to develop local and global citizenship with respect for self-determination and sovereignty of nations.
- ❖ Environmental education is not neutral but is value-based. It is an act of social transformation.

- Environmental education must involve a holistic approach and thus an interdisciplinary focus in the relation between human beings, nature and the universe.
- Environmental education must stimulate solidarity, equality, and respect for human rights involving democratic strategies and an open climate of cultural interchange.
- Environmental education should treat critical global issues, their causes and interrelationship in a systematic approach and within their social and historical context. Fundamental issues in relation to development and environment, such as population, health, peace, human rights, democracy, hunger, degradation of flora and fauna, should be perceived in this manner.
- Environmental education must facilitate equal partnership in the processes of decision making at all levels and stages.
- Environmental education must recover, recognise, respect, reflect and utilise indigenous history and local cultures, as well as promote cultural, linguistic and ecological diversity. This implies acknowledging the historical perspective of native peoples as a way to change ethnocentric approaches, as well as the encouragement of bilingual education.
- Environmental education should empower all peoples and promote opportunities for grassroots democratic change and participation. This means that communities must regain control of their own destinies.
- Environmental education values all different forms of knowledge. Knowledge is diverse, cumulative and socially produced and should not be patented or monopolised.
- Environmental education must be designed to enable people to manage conflicts in just and humane ways.
- Environmental education must stimulate dialogue and cooperation among individuals and institutions in order to create new lifestyles which are based on meeting everyone's basic needs, regardless of ethnic, gender, age, religious, class, physical or mental differences.
- Environmental education requires a democratisation of the mass media and its commitment to the interests of all sectors of society. Communication is an inalienable right and the mass media must be transformed into one of the main channels of education, not only by disseminating information on an egalitarian basis, but also through the exchange of means, values and experiences.

- ❖ Environmental education must integrate knowledge, skills, values, attitudes and actions. It should convey every opportunity into an educational experience for sustainable societies.
- ❖ Education must help develop an ethical awareness of all forms of life with which humans share this planet, respect of all life cycles and impose limits on human's exploitation of other forms of life.

Furthermore, in 2002 there was a World Summit for Sustainable Development (WSSD) that was held in Johannesburg, South Africa by the UN. This summit continued to discuss and emphasise the role of education as a way to eradicate poverty, inequality and to promote sustainable development of the environment, globally (Loubser *et al.,* 2014). Zwelibanzi (2016:44) also emphasises that the 2002 world summit "made a strong emphasis on "the need for socio-ecological, political and economic transformation". EE continues to make partnership with different stakeholders in the world to help spread EE worldwide. Different initiatives have been started, including the partnership between EE and UNESCO, UNEP and different departments of education of different countries; these are helping to educate about sustainable future during different seminars and conferences that are held in different parts of the world (Loubser *et al.,* 2014).

The development of EE from a global perspective was one of the biggest breakthroughs of the development of EE in different countries around the world. Countries such as Tanzania, Namibia and Zimbabwe and many more, have now included EE in their school curricula. The history of EE in South Africa is discussed in the next section.

2.1.2 The history of Environmental Education in South Africa

Irwin (1990), narrates that EE in South Africa was driven by non-government conservation and state agencies and the interest in EE in South Africa started during the 1960s. During this time, however, EE was not part of the curriculum and it focused much on various conservation movements that helped educate people about nature. Irwin (2003) adds that EE was not part of the curriculum and no attempts were made to include it in the curriculum until 1989. There were initiatives EE that were put in place, although, it was not part of the curriculum; initiatives like educating people about soil erosion and conservation of nature. Most of those initiatives were encouraged in the Belgrade Charter of 1975, Tbilisi Principle of 1977 and the Brundtland Report of 1989.

The first national conference of EE in South Africa took place in 1982 at the Treverton College, Mooi River in Natal (Melville, 2007). It was during this conference that took five-days, where the Environmental Education Association of South Africa (EEASA) was formed. Different authors, such as De Lange (2004) and Loubser *et al.* (2014) have indicated that since it was formed, EEASA has played a crucial role in the development of EE in South Africa. In agreement, Melville (2007) further explains that EEASA is responsible for the publication of the *Southern Africa Journal of Environmental Education* from 1984 as well as the *Environmental Education Bulletin* since 1985. All the publications made by the EEASA have made a huge impact on the growth and development of EE in the Southern Africa region.

In addition to the contribution of EEASA, Loubser *et al.,* (2014:55), also argue that the NGOs and provincial conservation agencies have played prominent roles in development of EE in South Africa. These NGOs include, amongst others, the Wildlife Society of Southern Africa (WESSA), the Umgeni Valley Project (UVP) and the National Environmental Awareness Council (NEAC). All these NGOs together with other stakeholders have played significant roles in the development of EE and also in helping people to learn about EE, regardless of the fact that EE was not yet part of the formal education system.

According to Mosidi (1997) and De Lange (2004), the first attempt to include EE in the formal curriculum in South Africa was through the *1989 White Paper of Environmental Education.* This the White Paper embraced in the Tbilisi Principles. Melville (2007) also highlighted that this White Paper was tabled in the South African parliament, but according to Clacherty (1993:56), it was never enacted upon in parliament. Clacherty (1993) further explained that lack of enacting of the White Paper of 1989 resulted into lack of implementation of EE into the formal curriculum.

During February 1990, there was a great improvement in the development of EE and such improvement gained attention from the political parties and NGOs (Loubser *et al.,* 2014). Among other reasons for the improvement in the development of EE during this time was the formation of the Environmental Education Policy Initiative (EEPI). The EEPI opted for a “political alignment and more democratic approach” to EE so that those who were practitioners would also be included in the development of the policy (Clacherty, 1993b:4).

The EEPI contested in different conference held in South Africa in favour of a curriculum to develop understanding values and skill for sustainable development and health living. As a

result, a resolution was reached at the National Education coordination Committee (NECC) conference in 1993, which states that:

> *"… the curriculum will develop the understanding values and skill for sustainable development and an environment that ensures healthy living"* (Clacherty, 1993b).

This clause, however, was revised by the policy framework of the African National Congress (ANC) in 1994 when the Tbilisi EE principles were included in the Education White Paper of 1995, which stated that:

> *"…Environmental education. Involving an interdisciplinary, integrate and active approach to learning, must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future enjoy a decent quality of life through the sustainable use of resources"* (Department of Education (DoE), 1995:18).

After these clauses were developed, the EEPI changed its focus to curriculum and became the Environmental Education Curriculum Initiative (EECI). Environmental educators working under the EECI later established themselves as the stakeholders in the curriculum development and this led to the development of the Revised National Curriculum Statement from Curriculum 2005 (Loubser *et al.,* 2014:59). According to Melville (2007), on 5th June 2000 (World Environment day) the Minister of Education established the National Environmental Education Project for General Education and Training (NEEP-GET) to effect proper introduction of EE in school curriculums. Zwelibanzi (2016:50) added that the "main objective of the NEEP-GET was to ensure that EE was integrated throughout the curriculum of the GET band (Grades R-9)".

Zwelibanzi (2016) points out that the introduction of the NEEP-GET supported the integration of EE in GET bands only but little has been done in terms of the integration of EE in the Further Educational Training (FET) band. It also transpired, from the number of studies that have been conducted on the integration of EE, that the focus has been more on the GET band than in the FET band. For example, a research conducted by Kimaryo (2011), Le Grange (2003), Maila (2003), as well as Lotz-Sisitka and Raven (2001), all focused on the integration and implementation of EE in the GET band. This has contributed to a general lack of knowledge when it comes to the integration of EE by teachers in the FET band. This study attempts to fill this research gap by focusing on the integration of EE by teachers in the FET band.

Having discussed the history of EE from both international and South African perceptives, the next topic will focus on environmental education and sustainable development.

2.2 Defining Environmental education

In order to understand what EE is all about, it is advisable to first look at, and clarify what environment is, and what it is composed of.

In his study, Haindongo (2013) note that most of the studies conducted about EE and its implementation lack a clear conceptualisation of what an environment is. Similarly, Kimaryo (2011:25) claims that there is a problem when it comes to defining what an environment is, because it depends on how people perceive it. Amongst other scholars, Tani (2006) conducted a study to find out how people perceive the environment and in her findings, she revealed that people perceive the environment in three different ways as follows:

Environment as an entity: Here people perceive the environment as an object that share no connections with them. Referring to this approach, Kimaryo (2011:25) comments that that "one can compare this way of understanding the environment with the way we see the moon and stars".

Environment as an experienced phenomenon: Tani (2006) explains that here individuals are the centre of the environment, being surrounded by space which is an environment. Kimaryo (2011:25) argues that this is a "subjective view of the environment" where people are superior to the environment and they only see it as a space.

Environment as a socially /culturally-produced phenomenon: Here, Tani (2006) viewed humans as shaping the environment according to his/her social and cultural behaviour. This simply implies that man's understanding of the environment is through his understanding of his own cultural/social aspects. For example, traditional healers will know not to uproot or cut down the whole plant for medication used because they may need it again in future.

Following these views, the environment may be defined in its totality, to include all the aspects that it covers. The definition of environment must include living and non-living things interacting together and using the environmental resources to find jobs and money to sustain themselves. As such, Kimaryo (2011:25) defines environment "as the totality of things that, surround man, which can be categorised into the biophysical, social, economic and political aspects". Figure 2.1 below is a diagrammatic representation of how these dimensions of environment interact. There is a biophysical dimension which is the base of

all dimensions because it includes living things, non-living things and all the systems that support life. Without life the other dimensions, such as social, political or economic dimension would not exist. Also, living things cannot survive without social aspects (good relationships amongst themselves), economic aspects (jobs and money to help sustain their life) and political aspect (policies and laws that helps govern the environment so that there is proper and equitable usage of the environmental resources). In other words, all these dimensions depend on one another. For example, laws, decisions and policies (political dimension) cannot be passed if there is no money (which is economic dimension) to implement them.

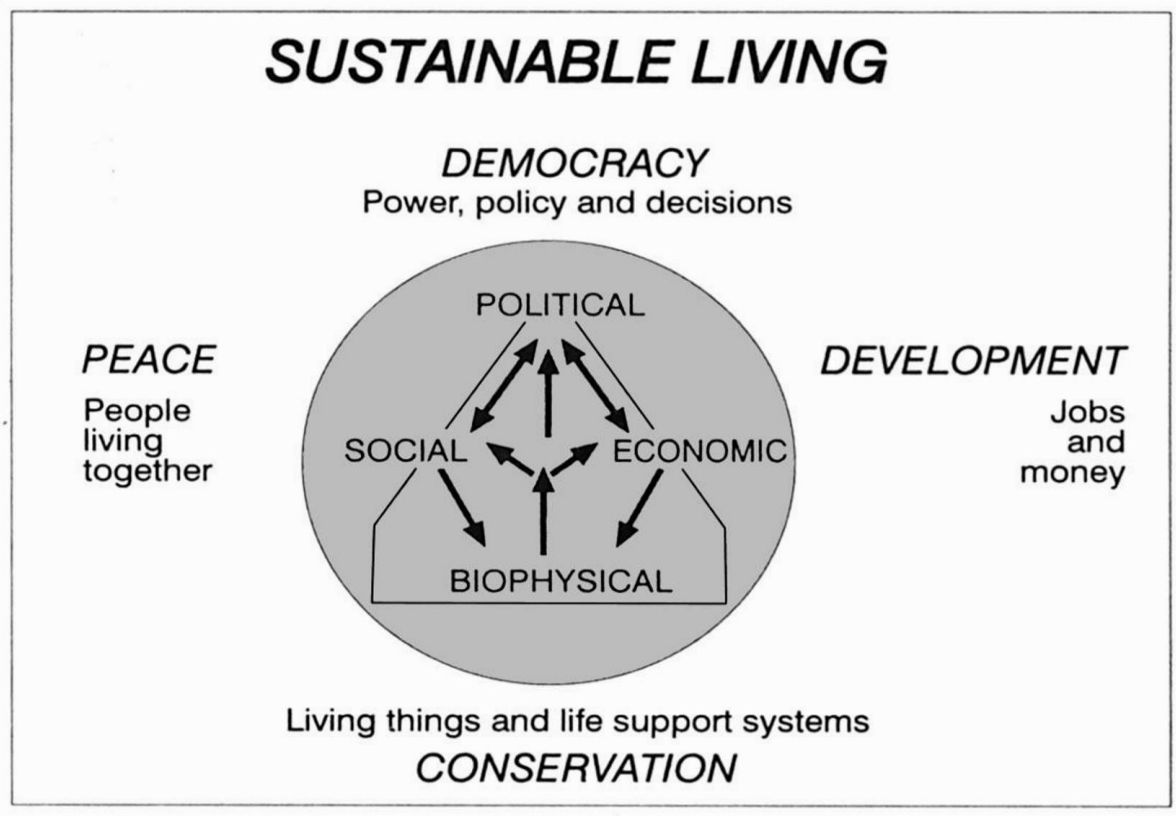

Figure 2.1: *Interacting dimensions of environment* (O'Donoghue, 1993:337)

In addition, people (the social dimension) cannot live without money and jobs (economic dimension) to sustain themselves and there will be no law, no money no interaction of people if there were no living and non-living things (biophysical dimension). Understanding the environment in its totality, therefore, means being able to understand all these dimensions and their relationship because together, they form the environment.

People need to have proper knowledge, skills and good attitude towards the environment, and understand how to interact with the environment in a sustainable way so that they do

not damage it, but sustain it for future generations. This suggestion can be made possible with proper EE practices.

2.2.2 Definition of Environmental Education

The first definition of EE was developed by UNESCO in 1968. During that time EE was defined as " the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biological surroundings" (Loubser, 1992:92). Similarly, the Tbilisi conference held in Georgia gave another definition of EE that says the same thing as the one above but in different words. In this conference, EE was defined as "a learning process that increases people's knowledge and awareness of the environment and associated challenges; develops the necessary skills and expertise to address the challenges, and foster attitude, motivation and commitments to make informed decisions and take responsible action" (UNESCO, 1978).

Janse van Renburg and Lotz (1998:9) also defined EE as a "continuous process of equipping people with knowledge, attitudes, skills and commitments to address socio-ecological issues". The point of emphasis from all the above definitions is that the aim of EE is to equip people with necessary skills, attitudes and knowledge to help them take care of their environment. People have to realise their relationship with the environment so that they sustainably live within it, respect and take good care of it for future generation's sake. Individuals, thus, need to be vigilant at all times when engaging from either economic, political or social perceptions about the environment. The decisions individuals make about the environment should help eradicate the environmental problems they face, not to create more. This view is supported by Le Grange and Reddy (1998:13), who also argued that "EE is intended for social change, so it should be shaped by critical and creative thinking".

In defining EE, three dimensions have been identified as key to the development and achievement of its aims and objectives. Lucas (1972) as cited in Le Grange (2002) identifies these dimensions as - education about the environment, education in/through the environment and education for the environment. These dimensions are discussed next.

2.2.2.1 Education about the environment

Scholars, such as Robottom (1987) and Melville (2007) describe education about the environment, as education that focuses on learners' cognitive abilities without promoting sustainable development. Robottom and Hart (1993:20) argue that the knowledge that one

has of the environment is the one that is referred to as ‘education about the environment’. In this dimension of EE, learners’ acquire knowledge inside the classroom when the teacher is teaching about the environment. Learners are taken as empty vessels that are waiting for knowledge from the teacher. Concurring with this statement, Zwelibanzi (2016:41) adds that when teaching EE inside the classroom, teachers are responsible for transmitting knowledge to learners.

Similarly, Robottom and Hart (1993:20) explain that education about the environment is mostly conducted inside the classroom, where learners are taught topics like, how to become national park rangers, EE teachers, outdoor operators and so forth. according to Kimaryo (2011), this dimension of EE was developed during the time when the EE movements that focused on the creation of environmental awareness amongst people were formed and it was in its infancy. When the view of education about the environment was introduced, it was aiming on reducing environmental degradation, however, people did not take any action on environmental degradation after education about the environment was introduced, hence, another view of EE was introduced - education in/through the environment.

2.2.2.2 Education in /through environment

Melville (2007:21) describes the concept, education in the environment, as “any form of education conducted outside of the traditional classroom, using the environment as a medium for teaching”. This view of EE is taken by many scholars as experimental learning that needs to be conducted outside the classroom, in the field. It also transpired in literature (Haindongo, 2013), that activities like, field trips allow learners to go out and learn in the environment. During this approach of environmental learning, learners are the active members and they learn through their interaction with the environment. Kimaryo (2011:28), also indicates that “learning in the environment helps learners to learn how to learn, an aspect which is currently being emphasised in education”. Kimaryo (2011) adds that learners will develop environmental awareness and concerns if they are engaged in this approach of education through/in the environment.

Education in/through the environment is seen by many scholars to have influenced the teaching of EE in many countries. For example, O’Donoghue and Russo (2004) highlight that in South Africa, active learning is used in teaching and learning through the use of hands-on activities in the environment. Similarly, Chatzfotiou (2006) highlights that the

national curriculum of England has encouraged active participation in problem-solving and in acquiring skills that are needed to improve the environment.

Some scholars, such as Tilbury (1993) and Huckle (1983), however, argue that even though education in/through the environment enhances active learning, it also disregards some of the vital aspects which needed to be considered in EE. Tilbury (1993) and Huckle (1983) highlighted socio-economic and political factors as some of the essential components that are not addressed by this view of education in/through the environment, that are essential in teaching and learning of EE. An additional perspective, education for the environment, is seen as addressing this gap.

2.2.2.3 Education for the environment

According to Kimaryo (2011:28), EE goes beyond learning about the environment and in the environment but must also include learning ethics of the environment. Similarly, Lee and Williams (2001) add that, this dimension of EE helps individuals to develop positive attitude or concerns for the environment so that they are able to take care of the environmental problems. Moreover, this dimension makes people responsible for improving the quality of the environment. Likewise, Klein (1997) states that education for the environment helps learners to develop skills that help them take care and protect their environment.

Different scholars, such as Zwelibanzi (2016) and Melville (2007), have argued that dimensions of education for the environment builds on the other dimensions which are education about the environment and education in the environment, however, Fien (1993) believes that this dimension of education for the environment is the most appropriate one for addressing environmental crisis, globally.

In South Africa, most of the natural resources are being depleted, so education for the environment should help learners to think critically before damaging natural resources. This will be possible if individuals involved in creative thinking and problem-solving in schools. Melville (2007) also asserts that “learners should be involved in decision-making and problem-solving”. Loubser (2012) adds that, in order for EE to produce environmentally-literate people, this dimension, education for the environment, must be included in learning processes.

All these three dimensions of EE, according to Kimaryo (2011), are interlinked and they should not be isolated. This is because the first dimension which is learning about the

environment enables one to acquire knowledge about the environment; education in the environment, helps to interact with the environment and get experience and understand the environment, while, education in the environment involves getting knowledge and understanding it, as well as effecting change for the environment. Where all these three EE dimensions work together, the environment can be sustained for future generations. The next section discusses the phenomenon of sustainability in relation to the environment.

2.3 Sustainable development

According to Tilbury (1995), the term, 'sustainable development', was developed by the Brundtland Commission report of 1987. This term was developed to address and meet both the needs of conservation and development. Kimaryo (2011:29) explains that the term, sustainable development, was first developed due to the conflicts between social development, economic growth and environmental conservation. The above scholars emphasise that the notion of sustainable development was developed to sustain the conservation of the environment. During the time that the concept of sustainable development was initiated, economic growth was dominated by approaches that did not consider the threat they posed to environmental resources (Kimaryo, 2011). This led to the development of the definition of sustainable education by Breitng (2000) who defines sustainable development as:

> *"a course of action or development which focuses on environmental protection while using the available resources to meet the needs of the people at present without destroying or exhausting resources because they will be needed by the future generations to sustain their life"* (Breitng, 2000; in Kimaryo, 2011:30).

In agreement with this definition, Gough (2002) adds that sustainable development is about bringing social, economic and environmental factors together because they cannot live in isolation. The main idea behind coming up with the notion of sustainable development was to help reduce the way the environment was abused for the benefit of the economy.

Breiting (2000), in his definition emphasised the goal of sustainable development, which is to take care of the environment now, without damaging it or destroying it so that even the future generation can also use it to maintain their lives. One can, therefore, conclude that sustainable development is a way in which people use resources, today while preserving them for future use as well.

In 2002, sustainable development was identified as the theme to discuss in education during the world summit on sustainable development held in Johannesburg, South Africa. In

that summit, the UN declared that 2005-2014 as the “Decade of Education for Sustainable Development” (DEFSD), (Loubser *et al.,* 2014:127). In 2012, the UN conference on sustainable development came up with an international agreement, which saw the setting of global sustainable development goals (SDGs) that will help in establishing a path of sustainable development in the world after 2015 and this led to sustainable development being the major concern in the world (Mwendwa, 2017:2).

The best way to achieve sustainable development is through education (Mwendwa (2017). Education for Sustainable Development (ESD) is discussed as the next topic.

2.3.1 Education for Sustainable Development

After sustainable development was established with principles during the Brundtland commission of 1987, there was a need for education that will assit people to understand what sustainable development was. Following the identification of that need, a special type of education was developed called, ESD, however, according to McKeown and Rously (2002:9), ESD was first developed by people who were not part of the education community and it was first formally described in Chapter 36 of Agenda 21. Agenda 21 was defined by the Australian government in 2004 as a blueprint that is to be used internationally by organisations, industries, government, and communities to help them achieve sustainability; Agenda 21 was first developed in Rio summit on the 14 June, 1992.

The reason for the development of ESD is described by UNESCO (2017:7), as to “empower learners to take informed decisions and responsible actions for environmental integrity, economic viability, and a just society for present and future generation”. In addition, Mwendwa (2017) highlights that ESD plays an important role in helping individuals to have “knowledge, skills and attitude” that are necessary for the proper shaping of a sustainable future. The council for environmental education for national curriculum for England and Wales also defined ESD as:

> *“Education that enables people to develop knowledge, values and skills, to participate in decision-making about the way they do things individually and collectively, both at local and global levels, that will improve quality of life now without damaging the planet for the future”* (Council for Environmental Education (CEE), 1998:3).

UNESCO (2014), also gave the definition of ESD as:

> *“Education for sustainable development allows every human being to acquire the knowledge, skills, attitude and values necessary to shape sustainable future”.*

The above two definitions of ESD put emphasis on sustainable future. The definition from the Council of Education of Wale and England, in its ending part says that "…without damaging the planet for future" whereas the other definition from UNESCO states that "…to shape sustainable future". It is clear, both the definitions are concurring with the aim of sustainable development, which is to use the available resources today without destroying those resources that will be needed by future generation. So one can then conclude that ESD is developed to teach about sustainable development, to help people know how to implement all the principles of sustainable development in their everyday life for the betterment of their tomorrow.

According to Kimaryo (2011), sustainable development focuses on economic, environmental and social problems. ESD is the education that focus on how the economic, environmental and social aspects interact with each other, without harming the resources that are essential for future generations. It can be said, therefore, that in order to introduce ESD, one needs to understand the relationship between the environment, economy and society. This relationship is best described in the sustainability model shown in Figure 2.2 below.

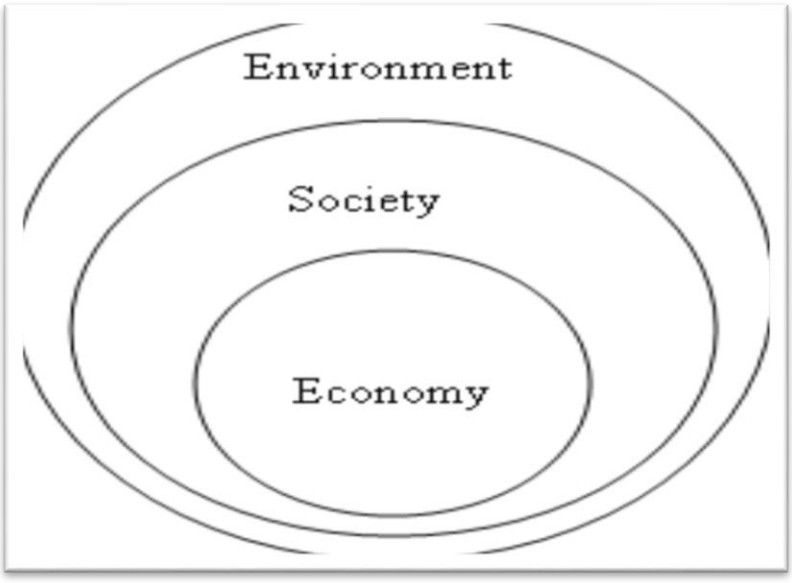

Figure 2.2: *Model for sustainability* (Mwendwa, 2017: 2)

The above model of sustainability is made up of the three pillars of sustainable development which need to work together to ensure a sustainable future. First, we have the environment, which owns the second pillar known as the society because the environment supplies the society with the natural resource - fresh water, air, as well as food (Mwendwa, 2017). The second pillar is the society which is found inside the environment and it is the area where

social aspects such as culture, beliefs and norms are practised. Since it occurs within the environment, without which the society would not exist. The third and last pillar is the economic pillar which is inside the society. This is because the economic aspects such as living costs, income, jobs and money are practised by people who are the members of the society, however, these pillars need to work in connection with each other. For example, without a good environment, societies will not be able to live properly; they would not be able to practise their culture and other aspects and the economic aspects will also be negatively affected, hence the cost of food and other aspects will increase.

The question then would be how ESD and EE relate to each other. This question is addressed next.

2.3.2 The Relationship between Environmental Education and Education for Sustainable Development

Different scholars have different perceptions about EE and ESD. This has given rise to a debate on how EE and ESD are related to each other. Scholars such as Fien (2001), Tilbury and Cooke (2005) as well as Yang, Lam and Wong (2010) believe that EE has developed to become part of ESD, whereas other scholars, like Loubser *et al.,* (2014) view ESD as an objective that should be added to EE's objectives. Nevertheless, there are other scholars who also believe that EE already includes ESD (Loubser *et al.,* 2014).

Hesselink, Van Kempne and Wals (2000), as well as Wals and Jickling (2000) suggest what are known as the four perspectives of EE and ESD. The first perspective sees EE as a part of ESD, hence, it is taken as an aspect that is included in the content of ESD. The second perspective sees ESD as part of EE which is an inverse of the first perceptive. The third perceptive sees EE taking over ESD and the last one sees ESD as a developmental stage of EE. All these perspectives have one thing in common - they all show that EE and ESD have got a connection.

EE is an education that aims on creating a "more democratic and environmentally just world", whereas ESD aims to create a "more sustainable world where individuals live in the environment, in the sustainable manner" according to Kimaryo (2011:31). Loubser *et al.,* (2014: 31) argue that apart from sharing different aims, EE and ESD share the same vision, which is "creating a better world where there is a balance between economy, ecology and society", thus, making it hard to separate EE from ESD because they have a lot more in common than differences.

EE and ESD, as seen in the above reviewed literatures, are working towards achieving the same goal, which is to produce individuals who are environmentally literate and can take care of their environment. This goal is easy to achieve if there is a proper integration of EE in all the curriculum, so the next topic reviews the integration of EE in school curriculum, starting with the international then the African as well as the South African perceptions.

2.4 International perceptions on integration of Environmental Education in schools

Internationally, EE is integrated in school curricula (Kimaryo, 2011:61), but only in a few subjects, such as Life Sciences (Biology) and Geography. There are several reasons mentioned in literature that restrict the integration of EE in school subjects. The first reason is lack of training in the EE integration process. For example, in a study conducted in Hong Kong by Chi-Chung ko and Chi-kin Lee (2003), teachers in primary schools were not able to teach EE because they lacked proper knowledge, lesson time and proper EE trainings. Similarly, Monde (2012) notes that lack of lesson time and proper training of EE teachers also hinder the production of environmentally literate learners in high schools of Zambia. This reflects that in those schools, EE was not integrated into the school subjects' curriculum.

Different scholars' highlighted lack of funding as the other reason that restricts the proper integration of EE in school curriculum. In a study conducted by Balaskovitz (2009) in Michigan (USA), it was discovered that lack of funding for teachers' training in EE led to lack of the integration of EE in schools. Similarly, De caralho (2011) claims that teachers in Brazil are faced with challenges of integrating EE in their subject, and lack of funding was amongst the common challenges he mentioned. This reflects that if there are no funds to support the integration of EE in schools, then it will not be integrated in school curricula.

Lack of integration of EE in school subjects is not only restricted by lack of funds and training, but other factors as well. Filhor and O'loan (1996) in Scotland identified lack of EE knowledge by teachers as the other reason that restricts the integration of EE. In China, Cheng (2012) indicates that most teachers do not integrate EE because they associate it with Social Sciences and Sciences subjects only.

Besides these methods mentioned above, there seems to be other ways in which learners get exposed to EE in some contexts and these ways may also be regarded as an integration of EE in curricula. One of the ways of implementing EE in school is to involve learners in community projects, like the projects that help to green schools, hence, some

schools in some parts of the world, encourage their learners to engage in community projects. In Canada, learners are encouraged to join the seeds foundation that is aimed at greening schools in Canada. In United Kingdom, learners are also encouraged to join the Jupiter project that is aimed at the maintenance of the gardens (Makhoba, 2009:32). These are some of the ways that these countries use in order to implement EE in their schools, and it gives learners proper knowledge and skills about EE. Involving learners in community projects reflects the educational dimension of education for the environment. This is because when learners are engaging in such projects like greening the school, they will be learning about the environment, in the environment and for the benefit of the environment. Furthermore, these projects also help develop positive attitude in learners towards taking care of their environment.

2.5 African perspectives on integration of Environmental Education in schools

In most African countries, EE is integral into the school curriculum on paper, but most of these countries have the same concerns of teachers failing to integrate EE in their subjects in the schools. According to Mathenjwa (2014:50), the majority of teachers in Ubombo circuit, KwaZulu Natal, in South Africa do not implement EE in their lessons. When asked why, they said that they lack pedagogical content knowledge (PCK) and the understanding of EE. Those who implement it also indicated that they do so informally, in subjects such as Geography and Life Sciences. The results of Mathenjwa (2014) concur with Le Roux (2009), in a study conducted in South Africa which found out that EE was not formally implemented in schools. Similarly, Haindongo (2013:175) in a study conducted in Namibia also identified lack of curriculum understanding by both, teachers and subject advisors as one of the problems that hinder the integration of EE into their lessons in schools. Mwendwa (2017:6), on the other hand reports that in Tanzania most schools integrated EE but in few selected subjects, such as Geography and Life Sciences. Here, EE was integrated in those subjects because these are the subjects with topics more related to the environment. This brings a confusion to learners who turn to think that EE is only associated to Geography and Life Sciences but not with other subjects.

Literature shows that most teachers have difficulties when it come to the integration of EE in their subjects. In his study, conducted in Namibia, Haindongo (2013) state that most of teachers did not know how to include EE in their curriculum. Dreyer and Loubser (2005) noticed that there is no clarity on how to implement EE in formal education system, even though most educationists have accepted the cross-curricula approach. This gives an

indication that there are still a lot of teachers in Africa who are not integrating EE into their lesson, however, in countries, such as Zambia where teachers have the knowledge of how to implement EE, they do not take it as a necessary content (Monde, 2012). One of the participants in Monde's study indicated that "EE components integrated in the existing subjects, were not many in examination papers" and hence even the teacher's effort when integrating those components was minimal (Monde, 2012:85). This shows that both the teachers and the examiner are not taking EE as an essential aspect. If these stakeholders do not take EE seriously, they will not be able to achieve its objective, which is to produce learners who are environmentally literate, even though EE is integrated into their school curriculums.

The integration of EE into school subjects need both the teachers and subject advisors to have knowledge of EE. Lack of knowledge on by both the teacher and subject advisor restricts its integration in the curriculum. Concurring with this statement, Monde (2012) maintains that lack of teacher knowledge is one of the barriers to integrating EE in school subjects because, if teachers do not know EE then it will be hard for learners to understand it. Correspondingly, Haindongo (2013:187) states that "teachers have a limited knowledge of EE and they don't understand how EE is included in their curriculum". Mwendwa (2017:4) reveals that some of the teachers also admitted that they lack adequate knowledge and understanding about EE and its integration. In cases where teachers do not include EE in their subject because they lack knowledge of EE, the assumption would be that there is lack of implementation of EE in schools and into the lessons.

In the survey conducted by Monde (2012) in Zambian high schools entitled - *Barriers To Successful Implementation of Environmental Education in Zambia High Schools* - lack of teaching resources was seen as one of the biggest problem that leads to lack of implementation of EE in school subjects. The results from Monde's study showed that some schools had no EE teaching and learning resources, and even those who claims to have such resources also said that the ones they have are inadequate. While UNESCO (1980) had emphasised that the integration of EE into formal education should take into account teaching resources, it seems that schools which want to implement EE in their subjects lacks proper resources, an aspect that hinders the integration of EE in schools.

Different scholars, such as Kimaryo (2011), Monde (2012), Zwelibanzi (2016), and Haindongo (2013) highlight lack of teacher training as the other aspect that reduces the integration of EE into the subject. By the same token, Mwendwa (2017:9) claims in her results that "out of eight teachers interviewed, only two admitted to having received specific

training on subject matter". This shows that we still have a number of teachers who lack training on how to integrate EE in their subjects. Some teachers were also found to be unaware of the integration of EE in the school subject. This was from the study conducted by Kimaryo (2011:58) in Tanzania and this was because the teachers were not trained to integrate EE, although, it has been mandated that all primary teachers in Tanzania must integrate EE in their subjects. This gives an impression that most teachers do not integrate EE in their respective school subjects.

The Department of Education seem to have little influence in the integration of EE into the school subject, even though they are the ones calling for such integration. Mathenjwa (2014: 52) states that there are many challenges that restrict the integration of EE into the school subjects but "some challenges emanated from poor support given by the Department of Education". It also transpires from the conclusion of the study conducted in Zambia by Monde (2012:92) that the "National Policy of Education" provides little help in Zambian high schools, hence, the education policy in Zambia is to blame for lack of integration of EE in Zambian high school, because it provides little guidance to teachers who struggle to integrate EE in their lessons.

Even though most literature show that there are challenges in the integration of EE, there seems to be a consistent view in literature that the integration of EE in school subjects enables people to take care of their environment and reduce all the dangers that their environment might face. For example, Haindongo (2013:44) asserts that "EE is important to all countries which experience environmental problems" because it helps reduce those environmental problems, such as environmental degradation. Kimaryo (2011:32) believes that the integration of EE in school curriculum will help learners with necessary skills, attitude and knowledge, which will be necessary for them to take a good care of their own environment.

Most of the challenges facing the integration of EE in school curricula that are reported in international literature are also experienced in the African context, for example, lack of training on how teachers can integrate EE in their school subjects. In the next topic, the integration of EE is now narrowed to the South African perception.

2.6 Integrating Environmental Education in secondary schools in South Africa

The problems of integrating EE into the school curriculum occurring in African countries such as Namibia, Zambia and Tanzania as well as all over the world are also experienced in South Africa. Le Roux and Maila (2004) contend that there is still a big challenge in trying to integrate EE into the curriculum. Schudel *et al.,* (2008) reveal that in South Africa, only a few schools amounting to twenty five percent, effectively integrate EE in their lessons.

Before the dawn of democracy in 1994, in Kwazulu Natal, South Africa, both teachers and learners were being taught how to take care of their environment by the non-governmental organisations WESSA and the Ezemvelo KZN, although, all the activities that those organisations run were not part of the curriculum (Mathenjwa, 2014:16). Following the adoption of South Africa's post-1994 constitution, every citizen of South Africa now has a right to a healthy environment (Republic of South Africa, 1996). As a result, every institution in South Africa (formal or informal) was mandated to follow that statement from the Constitution and this has also led to EE being included in the formal curriculum in South Africa.

South African schools strive to produce learners who are environmentally literate, however, this seems to be difficult because teachers, the ones who are supposed to educate the learners, seem to lack the understanding of the term, environment, let alone the concept of EE (Makhoba, 2009). Mathenjwa (2014) believes that it is the variation on the definitions of EE that makes it difficult for teachers and learners to understand what EE means, hence they tend to be confused and fail to integrate EE in their school subjects. Different scholars have defined EE in different ways. The White Paper (1995) defines EE as a process that must include interdisciplinary, integrated and active learning approach. Janse van Rensburg and Lotz (1998b:9) believe that EE is a "continuous process of equipping people with the skills, attitude, knowledge and commitment" that would enable people to find solutions for environmental problems they face now and to prevent new problems in future. This definitions have two different aspects - the first one wants EE to be found in all branches of learning whereas the other dwells on solving environmental problems. This might bring misconceptions to teachers who are not trained in EE because they will expect one definition or different explanations that mean one thing in different words, hence, leading to lack of integration of EE even though the government has mandated that EE must be integrated into all subjects.

For the integration of EE in all subjects to be a success, teachers are expected to read the necessary policy documents such as the CAPS document. Scholars such as Nhlongo (2015:35) and Mbatha (2016) indicate that “the curriculum developers encourage teachers to ready the policy documents when teaching”. Findings from a study conducted in Nkomazi East Circuit at the Ehlanzeni District, Mpumalanga Province by Nhlongo (2015) showed that teachers in that study did not read the policy documents because they did not know the curriculum objectives, aims and outcomes whereas these are clearly indicated in the policy document (CAPS document) that they use; if teachers do not read the necessary policy documents, then they will likely fail to integrate EE in their lessons.

The biggest challenge that the DBE in South Africa now faces is the integration of EE in school subjects. Mathenjwa (2014) contends that the government has developed polices to integrate EE in all subjects, but one of the problem was that both teachers and subject advisors lacks EE skills and knowledge, hence, it becomes difficult for them to integrate EE in their school subjects. Kimaryo (2011) concurs with this statement and she expressed that lack of knowledge about EE is the biggest challenge for teachers. If there is lack of knowledge about EE by teachers, it follows then that there will also be lack of integration of EE in the subjects irrespective of the mandate from the Department of Education to integrate EE in all subjects in formal school curricula.

Literature from different scholars show that South Africa is one of the countries that has got few universities that offer EE. Loubser *et al.,* (2014) list the University of North-West, Rhodes University, University of South Africa and the University of Stellenbosch as the those that offer EE in South Africa. This reduces the number of graduates in EE who will become specialists in EE, and help teachers integrate EE in their subjects. According to Mathenjwa (2014:19), the lack of universities that offers EE courses in South Africa hinder the possibilities of producing teachers who are specialists in EE due to the few universities, hence, many teachers lack qualifications in EE. Zwelibanzi (2016:148) in a study conducted in South Africa about special needs schools also comment that “teachers in special needs schools generally lack relevant qualification to be able to teach EE”, hence, there is lack of integration of EE in school subjects in such special schools. Zwelibanzi (2016) adds that there is a lack of EE specialist in special needs schools to come and fill the posts for subject advisors. There is a consistent view in literature that lack of teacher training and qualification poses problem for the integration of EE in Life Sciences in special schools of South Africa. Makhoba (2009) believes that training educators to accept changes can help the integration of EE in all subjects to reach its goal of developing citizens who are

environmentally literate and can take care of their environmental problems wherever they face them.

Educators need to be enriched and supported by the DBE in order for them to effect good teaching and learning in schools. This can be achieved through workshops, school visits and conferences, however, some researchers are of the view that the Department is conducting workshops that do not support teachers and there are no school visits by the Department. According to Mathenjwa (2014:20), the workshops that the DBE conducts about the implementation of EE seem to have no impact on equipping teachers with knowledge and skills to integrate EE in their subjects. Schudel *et al.,* (2008) add that the DBE does not conduct follow-ups after their workshops to ensure proper implementation of EE in all school subjects since subject advisors do not conduct schools visits to support their teachers. It also transpired from the study conducted by Zwelibanzi (2016:154) that subject advisors are "responsible for conducting workshops that are problematic" because those workshops are facilitated by people who are not subject experts and are poorly trained to workshop teachers about EE. This also shows that the problem that we have as a country from lack of integration of EE into school subjects needs serious attention, therefore, DBE must develop strategies and guide lines to help develop an understanding of EE at both school and district office level.

Resources in schools are one of the tool that help teaching and learning to be effective. The other factor that limits the integration of EE in school subjects is that most of the EE educators do not have resources that they can use to help them teach it. Zwelibanzi (2016:157) writes that "if teachers are to teach EE well, they need to be well equipped and therefore need to be supported with resources or be taught to create their own". Lack of such support and resources will result in the lack of integration of EE in school subjects.

Having reviewed different scholars' perceptions about the integration of EE in the international, African and South African perceptions, the next topic discusses possible ways of integrating EE in the curriculum.

2.7 Possible ways of integrating Environmental Education in the curriculum

UNESCO (1978), claims that EE can be integrated into secondary school in different ways. Similarly, Kimaryo (2011:34) argues that "there is no universal way of including EE in the curriculum or education programme". Different scholars such as Zwelibanzi (2016); Kimaryo (2011); Monde (2012) and Haindongo (2013) indicate that EE can be included in the

curriculum using three different approaches - as (a) an independent subject, or (b) as a cross-curricular subject, or (c) as a theme organised around significant issue and problems. Zwelibanzi (2016) asserts that all these approaches are appropriate for the integration of EE but they have their strengths and weaknesses. These approaches are discussed next with their strengths and weaknesses.

2.7.1 Environmental Education as an independent subject

One way of including EE in the school curriculum as indicated by the different scholars above, is as an independent subject. According to Mohammed (2016:65), in this approach "EE will be allocated its own time and content" and be taught as other subjects, such as Economics and English. This approach is used in many countries around the world, such as Tanzania. Kimaryo (2011) indicates that this approach is preferred by teachers because it is manageable and easy to implement, however, Rusinko (2010) argues that EE as an independent subject means it will not be related to other subjects and it will have a narrow focus. If EE is an independent subject not all learners in school will be studying it for Kimaryo (2011) believes that if learners are given an option to choose subjects, some may not choose EE, hence, some of the principles of EE will not be achievable, for example, the principle which states that everyone must have knowledge about their environment.

Different scholars, such as Gough (1997) and Powers (2004), however, maintain that treating EE as an independent subject hinders the aim of EE of re-establishing the relationship between humans and environment. Similarly, Kimaryo (2011) posits that treating EE as an independent subject separates humans from the environment. UNESCO in Kimaryo (2011:35) also stated that "EE should not be just one more subject to add on existing programs, but should be incorporated into programs intended for all learners whatever their age". Mohammed (2016) points out that the inclusion of EE in school curriculum must be in a cross-curricula manner which is discussed next.

2.7.2 Environmental Education as a cross-curricula subject

Kimaryo, (2011:35) elucidates that EE can be integrated into all the school subjects as a cross-curricular issue. Lacey and Lomas (2013) see this approach as a whole curriculum approach to EE which is integrated in all school subject curricula, from the General Education and Training to Further Education and Training (GET-FET). Mohammed (2016) believes that this approach brings collaboration in different subjects which make learning more meaningful.

Kimaryo (2011) agrees that the integration of EE into other subjects helps learners to develop proper skills, attitude and understanding, which help them to conserve their environment. In support, Bolstad (2004) states that if EE is associated with existing subject, it increases its chances of having space in the curriculum rather than as a new subject. In other words, if EE is integrated into different subjects, the gap between what is done in class and what is prescribed in EE will be reduced (Palmer, 1998).

Many scholars feel that this approach is the appropriate one for the integration of EE, although, there seem to be some researchers that disagree with this approach. Kimaryo (2011) and Maila (2003:4) insist that this approach demands time, resources and specialised skills when implementing, and it makes the process difficult. In addition, Kimaryo (2011) notes that teachers find it difficult to link EE with their subjects because there is no clear guidance of implementing it from the DBE. Drake (2004) adds that most teachers do not feel comfortable using this approach to teach, because they lack proper integrating knowledge.

2.7.3 Environmental education as themes around significant issue and problems

According to Flaws and Meredith (2007), this approach is the most effective approach for integrating EE in school curriculum. This approach is not restricted to any subject, and involves learners and teachers identifying and solving environmental problems in their communities. During this approach, learners are active members who are involved in problem-solving, while the teachers only provide guidance and resources to learners that will help them solve the problems. Mohammed (2016) sees this approach as the one wherein the curriculum is more related to real-life environmental situations. Furthermore, Mohammed (2016:66) points out that this approach is seen as the one that “enable learners to develop proper skills, for identifying, classifying and analysing data related to EE issues”.

The theoretical framework that underpinned the study is discussed next.

2.8 Theoretical framework

To analyse how teachers are supported to integrate EE in Life Sciences, the researcher used Urie Bronfenbrenner’s ecological systems theory as a lens. This theory and its relatedness to the analysis is presented in this section.

2.8.1 Ecological system theory

The researcher adopted the ecological system theory, developed by Bronfenbrenner (1979), to understand the participants’ experiences regarding the integration of EE in the teaching and learning of Life Sciences, in the participating schools. The ecological systems theory

explains how the development of human beings is influenced by their environmental systems. Bronfenbrenner identifies four dimensions of environmental systems - (a) the Micro-system, (b) the Meso-system, (c) the Exo-system and (d) the Macro-system.

2.8.1.1 Micro-system

Geldenhugs and Wever (2013:3), explain that the micro-system "represents individual immediate context, characterised by direct interaction process" such as those with close friends, teachers in school and parents at home. Similarly, Berk (2000) maintains that the micro-system is the system where the child has direct contact with his/her own environment. In the case of this study, I view the teacher as this sub-system regarding the integration of EE for learners to be developed according to its principles.

The micro-system is represented during teaching and learning in the classroom, although, this is not only achieved in class but also by taking learners into the environment and engaging them there (Kimaryo, 2011). In this way, the micro-system involves the interaction of learners with each other in the environment about what they are being taught. Furthermore, when learners are interacting with each other, they use what is known as, the bi-directional influence, wherein, knowledge goes in both directions, from one learner to the other (Bronfenbrenner, 1979).

2.8.1.2 The Meso-system

The meso-system represents the structures of the child's micro-systems together with the connection between those structures, according to Berk (2000). Bronfenbrenner (1979:25) explains that the meso-system represents the relationship between different settings, such as peer group, school, home, church, parents, among others.

Within the school system, the meso-system is represented by the interaction of learners in peer group during activities such as hands-on-activities, where learners are learning in the environment by doing. Kimaryo (2011) suggests that hands-on-activities are one of the best way of integrating EE in the school curricula, however, the meso-system in integration of EE may also include the interaction of learners and teachers with people like nature reservists or environmental support groups during school field trips on EE. This system also includes the class discussion between learners and teachers inside the class and also the action that the environmental learners take in their school environment. For example, when learners after being taught about pollution decide to clean the school by picking up papers.

2.8.1.3 The Exo-system

For the exo-system, the individuals are not embedded in the environment, but they are involved (Berk, 2000). In this dimension, the development of individuals is encouraged by people who are not involved directly in the individual's environment. During the integration of EE, this system may be represented by teacher's meeting with supervisors, workshops in/out of the school, departmental and school policies about EE and other structures.

In the integration of EE, there are different people who are involved but not seen in the classrooms. These people include the subject advisors, the ones who give guidance to the teachers on how to integrate EE policies in their subject's curriculum. Monde (2012) emphasises that for successful implementation of EE, subject advisors must have proper skills and knowledge, however, if that is not the case, EE in that school will not be taught well in all subjects because teachers will have no help and the learners will then be environmentally, illiterate. Subject advisors do not interact with learners directly, but they have an interaction with teachers who have a connection with children.

The exo-system can also be exercised in school when the school governing body (SGB) and the school management team (SMT) sit and discuss the funds that can support in buying the resources that are needed by both the teacher and learners to integrate EE in the curriculum. Kimaryo (2011) notes that for EE to be implemented well, teachers need to be supplied with resources to help them implement it. In addition, this system also includes the collaborative development of EE policies to be implemented by teachers in class when teaching Life Sciences, even the workshops about the integration of EE also fall under this system wherein teachers learn about the process. If teachers are not well equipped to integrate EE in their subjects, then learners will lack knowledge about EE and they will not be able to take care of their environment.

2.8.1.4 The Macro-system

The macro-system is regarded as the outer most layer of the child's environment and consists of the cultural world that surround the learners (Bronfenbrenner, 1979). The macro-system, includes historical and economic systems, beliefs, governmental policies and cultural customs. Flynn (2015:23) concludes that the "macro-systems in an ecological model include external elements such as the economy, over which there is little control, but which has a significant influence on activities".

In the case of this study, the macro-system includes the EE policies developed by the government. As Loubser *et al.,* (2014) narrate that after 1994, when South Africa became

democratic, it was mandated that EE must be integral to all subjects' curriculum; this mandate was introduced with policies to help the process. In this study, the macro-system also includes the cultural customs of both teachers and learners, their historic events as well as the economic systems that influence their lives.

2.9 Chapter Summary

This chapter presented the history of EE from the international, African and South African perspectives; EE and sustainable development were also discussed. It also transpired from the reviewed literature that the integration of EE is still a major challenge in most countries, including South Africa. The study's theoretical framework, the ecological systems theory, was also discussed. The next chapter outlines the research methodology that was used in conducting the study.

CHAPTER 3: RESEARCH METHODOLOGY

The previous chapter examined the literature related to this study. In the review, the global and South African history of EE were outlined. EE was also defined according to different scholars, and then sustainable development was also outlined, followed by education for sustainable development (ESD) together with the relationship between EE and ESD. The chapter concluded with discussions on the integration of EE in different contexts, from the international, African and South African. The possible ways of integrating EE into the school curriculum, and the study's theoretical framework, the ecological framework were presented.

This chapter presents the methodology that was followed to conduct the research and conclusions drawn. The chapter consists of ten sections. The research paradigm relevant for this study is outlined followed by the research approach, the research design and sampling methods. Details are provided on the data collection methods, the data analysis' strategies, followed by how ethical issues that were relevant to the study were addressed.

3.1 Research paradigm

Before conducting a research, the researcher needs to decide on the research paradigm that will assist during the investigation (Snape & Spencer, 2003:2). Neuman (2000) and Creswell (2003) describe the research paradigm as composed of epistemology and ontology (see also Rehman & Alharthi 2016). Ontology is the description of the researcher's beliefs about the truth and how such truth exists. For example, the positivistic ontology is that there can only be a single truth, that which is observable, verifiable and discoverable. The positivistic reality or truth is objective and independent of the researcher (Scotland, 2012). On the other hand, the interpretivist ontology, detailed below, is that there are multiple realities or truths. Mohammed (2016) elucidates that ontology is about the belief on how the studied phenomenon came to being. In other words, the ontological assumptions are those that constitute the reality (Creswell, 2013; McMillan & Shumacher, 2010, Neuman, 2000).

Epistemology is the philosophy of how knowledge is acquired and "communicated to other human beings" (Cohen, Manion, & Morrison, 2007, p. 7; Mohammed, 2016). Depending on the researcher's beliefs or epistemological assumptions, knowledge can be acquired objectively (positivistic) or subjectively according to the knowers' values or experiences in their contexts (Guba & Lincoln, 1994). Bahari (2010) defines epistemology, simply, as a way

in which the researcher gains knowledge from the participants. This can be done by following different methods, concepts and procedures which are informed by the researcher's philosophical beliefs about knowledge and knowledge generation. Similarly, Rescal (2009:9) defines epistemology as a way "in which knowledge came to be known".

Mackenzie and Knipe (2006) identifies five major research paradigms as - positivist, constructivist, interpretivist, transformative and pragmatism. This study sought to understand the world of human experience through the interpretivism paradigm. This paradigm was chosen because its ontology and epistemology assumptions are best suited to the purpose of this study.

3.1.1 Interpretive paradigm

Interpretive paradigm is based on relativism, a view that reality subjectively differs according to personal experiences and values (Creswell 2003; Crotty, 1998; Guba & Lincoln, 1994). Ontologically, the interpretivist paradigm believes that there is no single reality, but realities are created by people. The epistemological belief of the interpretivism is that reality needs to be interpreted and from those interpretations we can generate knowledge through value-laden socially and subjective interpretations. According to Thanh and Thanh (2015:24), the interpretivist paradigm "allows researchers to view the world through perceptions and experiences of participants". In the interpretivism paradigm, the researcher uses the participants' experience to interpret his/her understanding from the data collected from the participants. The aim of the interpretivist is to interpret and understand human behaviour (Bahari 2010; Mohammed 2016).

This study followed the interpretivism paradigm because it sought to explore how Life Sciences teachers were supported to integrate EE into their lessons. The knowledge in this study was obtained through the interpretation of the participants' responses which were collected through the one-on-one interviews and the analysis of documents.

In the same way as the research paradigms, there are various approaches to conducting research. These are approaches are also informed or are consistent with the selected research paradigm. In the following section the researcher presents literature on research approach chosen for this study.

3.2 Research approach

Depending on a researcher's ontological and epistemological assumptions (see section 3.1), a research process can be approached either qualitatively, quantitatively or in a mixed approach. These are the three dominant approaches in social research (McMillan & Schumacher, 1997; McMillan & Schumacher, 2010). A researcher who is aiming to obtain objective knowledge through scientific facts will follow a quantitative approach, while one who is aiming for a socially constructed reality will follow a qualitative approach (Newman & Ridenour, 1998).

This study followed the qualitative approach because it intended to understand the participants' experiences or perspectives about the research topic rather than to measure the effects experimentally as would be the case for a quantitative research. Qualitative approach is explained next.

3.2.1 Qualitative approach

A qualitative approach involves the collection of data on a "naturally occurring phenomenon" and the collected data are in words not numbers, according to McMillan and Schumacher (2010:23). Magi (2010) in Mathenjwa (2014:35) defines a qualitative approach as the method that involves an understanding of human behaviour and reasoning that governs human behaviour. According to Tillery, Varjas, Meyers and Collins (2010:88), a qualitative study is "guided by the participant's view" and that view is the one that shapes the analysis of data. Neuman (2000:124) describes qualitative research as being cyclical and non-linear, which gives the researcher an opportunity to move backwards and side-ways by asking backup questions before moving on. Leedy (1993:141) adds that qualitative research is mainly focused on field research.

In qualitative research data are collected in the form of words. This allows participants to bring their views and experiences about the phenomenon being studied (Mathenjwa, 2014). In this study, participants were able to express their own opinions about the phenomenon being studied which was to investigate the support provided by the DBE to Life Sciences teachers to integrate EE into their lessons.

3.3 Research design

McMillan and Schumacher (2010) define the research design as a plan for intervention and data collection. Each research approach has research designs that are suitable for its epistemological assumptions. Quantitative researchers, for example, use true experimental research design to test their hypotheses and to develop measurable truths about their research problems. In mixed-methods approach, as well, there are various research designs that depend on how the qualitative and quantitative data are collected. For example, the mixed-methods researchers may use explanatory sequential design where a researcher begins by collecting quantitative data and follows it up with qualitative data to explains the emerging patterns from the quantitative analyses (Creswell & Plano Clark, 2011).

Similarly, in qualitative approach there are several research designs that can be followed to conduct the research. These include, case study, phenomenology, grounded theory, participatory action research, narrative research approach, to mention but a few. In pursuit to explore how Life Sciences teachers in Vhembe District are supported to integrate EE in their subject's curricula, this study followed a phenomenological case study design – a case study design focuses on a particular phenomenon. In the following sections the researcher discusses this chosen design.

3.3.1 Phenomenological case study

According to Smith, Flowers and Larkin (2009:346), phenomenology is "a philosophical interpretative, qualitative research design which explores personal experiences" displayed by participants. In phenomenology, the researcher pays attention or focuses on participants' experienced contextual realities regarding the phenomenon that is being studied. Crawford (2016:62) claims that "Phenomenological research allows one to understand the essence of a human experience in order to gain a rich understanding of a particular experience from the perspective of the participant(s)." Similarly, Bliss (2016:14) and Merriam (2009) regard phenomenology as a process that is followed to gain "comprehensive details that provide a basis for reflective structural analysis that reveals the essence of experience".

These definitions of phenomenology correspond with those of a case study design. Creswell (2013:97), details a case study as "a qualitative approach in which the investigator explores a real life contemporary bounded system or multiple bounded systems over time, through detailed, in-depth data collection involving multiple sources of information". The in-depth data are collected from the participants in their real contexts to understand their lived experiences. That is what made it appropriate for this study to combine both

phenomenology and case study – to gather a better and more in-depth understanding of the participants' experiences in their contexts.

There are different types of case studies - the explanatory case study, which focuses on the explanation of a phenomenon or a question; the exploratory case study, which is usually used to "explore the assessment of an intervention that has unclear or multiple outcomes" (Mohammed, 2016: 76); then the descriptive case study is the other type of case study which is used when a researcher wants to describe a phenomenon or intervention within the real-life context that it occurs. This particular phenomenological case study is descriptive in nature, hence, describing the experiences of teachers and the subject advisor on the phenomenon of support provided by the DBE to Life Sciences teachers to integrate EE into their lessons.

3.4 Sampling

Different research approaches have different sampling strategies. Mohamed (2016) explains that the sampling strategy to be use in a research study depends on whether the study is qualitative, quantitative or mixed methods. The major difference between qualitative and quantitative sampling is that the former follows non-probability methods while the latter follows probability methods. Probability sampling means that all members of the population stand an equal opportunity to be selected randomly as informants in the research project. Non-probability sampling, on the other hand, is intentional. For example, McMillan and Schumacher (2010:325) define qualitative research sampling as "a selection of information-rich cases for an in-depth study". A researcher, therefore, cannot randomise in selecting information-rich participants but can have specific criteria to identify and select them.

Creswell (2013) outlines that quantitative research samples are usually large and they best fit statistical analyses, whereas qualitative research samples are usually small. In addition, the sampling size of a study also depends on the "purpose of the study, the research problem, major data collection strategy and the availability of data" (Mohammed, 2016:81). McMillan and Schumacher (2010) identify some of the quantitative sampling strategies as random sampling and stratified sampling. The examples of qualitative sampling strategies from McMillan and Schumacher (2010) include, purposive sampling, quota sampling, convenience sampling and snowball sampling.

This study followed a combination of purposive and convenience sampling strategies. Convenience sampling in this study was used to sample three schools from the Mutshindudi

Circuit. There are ten secondary schools in the Mutshindudi circuit that offer Life Sciences and for this study only three were conveniently selected because they were accessible. Purposive sampling was use to select information-rich teachers as study participants. The phenomenon that was being studied was support provided by the DBE to Life Sciences teachers to integrate EE into their lesson, thus, purposive sampling was used to select Life Sciences teachers who had first-hand experience of the phenomenon being studied. Convenience and purposive sampling are discussed next.

3.4.1 Convenience sampling

According to Etikan, Abubakar and Alkassim (2016:2), convenience sampling is a "nonp,robability or non-random sampling where members of a targeted population that meet certain practical criteria" are selected for the purpose of the study. The practical criteria that needed to be met in convenience sampling included amongst others, the availability of the population and wiliness to participate. Creswell (2013:1450) adds that during convenience sampling, the researcher selects participants who are willing and are available to be studied. Etikan *et al.,* (2016) mention that convenience sampling is also affordable and easy because the subjects of the study are always available. In this study, three schools were conveniently sampled (see section 1.7.3).

3.4.2 Purposive sampling

Patton (2001) notes that in purposive sampling the researcher chooses the participants that are rich in information and who possibly have knowledge about the phenomenon that is being studied. McMillan and Schumacher (2010:138) explain purposive sampling as a method of selecting participants with certain characteristics. As such, this study purposively selected three Life Sciences' teachers from each of the three conveniently selected schools. This sampling would have included one Life Sciences teacher per grade from Grades 10-12 in each of the three schools, however, in all these schools, Life Sciences classes from Grades 10-12 were taught by one teacher and that reduced the sample to three teachers. In addition, one subject advisor for Life Sciences, from Mutshindudi circuit was also purposefully selected. In total, this study had four participants and, although this sample was small, the researcher regarded it as enough to provide the information required for this study because there was no intention to generalise the findings to a larger population.

3.5 Data collection

Creswell (2013:81) refers to data collection as a "process of gathering and measuring information on variables of interest in a systematic fashion that enables one to answer

research questions". The concept 'variables', although, it is not necessarily used in qualitative research, this definition of data collection still applies to such research because there are phenomena of interest for which data are collected. McMillan and Schumacher (2010:326) identify five major methods of data collection: observation, interviews, questionnaires, document analysis and the audio-visual materials. There are various types of each of these methods, for example, interviews may be structured, semi-structured or unstructured. Stanley and Wise (1993) note that in phenomenological case study research, the semi-structured interviews and participant observation are the common methods used to collect data. As indicated phenomenology and case study focus on individuals' experiences in their life world.

Participant observation was not followed, however, this study exhibited characteristics in line with the comments of Stanley and Wise (1993) and used semi-structured interviews. Zwelibanzi (2016) argues that when a researcher uses a phenomenological design, they may use document analysis as another method of data collection, therefore, in this study two methods of data collection were followed: document analysis and semi-structured interviews. These methods were deemed the most suitable for this study because they can provide rich information to address the research questions. In addition, the researcher regarded EE as a process that can be effective if there is a systematic relationship between the people and the documented strategies. These methods are discussed in the next section.

3.5.1 Document analysis

Bowen (2009) describes document analysis as a way of reviewing documents which might be electronical or printed materials. According to McMillan and Schumacher (2010:361), there are three types of documents, namely, personal documents which includes diaries and letters, official documents which includes policy statements and personal files, and object symbols that are used to suggest meanings and value.

McMillan and Schumacher (2010), states that the integration of EE into the school curriculum is influenced by official documents, such as the curriculum policy document. This study analysed official documents - the CAPS Grade 10-12 policy document, textbooks and pacesetters for Life Sciences. This was done in order to see how these documents address the issues of integration of EE in Life Sciences in secondary school. There was no need to select or sample these documents because they were the only ones used by the participants.

3.5.2 Interviews

According to Creswell (2013:217), “a qualitative interview occurs when researchers ask one or more participants, general, open-ended questions and record their answers”. The open-ended questions are asked so that the participants can answer the questions based on their own experiences. In this study, however, semi-structured one-on-one interviews were used to collect data. This study also adopted the use of one-on-one interviews so that even those participants who were articulate and those who did not feel comfortable sharing ideas could easily be part of this study and be able to express their views in a safe space with only the researcher. This method was used for both the teachers and the subject advisor. One-on-one semi-structured interviews were used because of the following advantages (Haindongo, 2013: 64),

- ❖ They limit misunderstanding of questions since participants will get clarity where they do not understand the question;
- ❖ They allow follow-up questions by the researcher where he/she seeks clear understanding on a question being asked;
- ❖ They accommodate all participants including those who are hesitant to speak and those who are articulate.

Creswell (2013) argues that one-on-one interviews have their own disadvantages. They require more time, more money and energy to conduct, especially if the participants are many. These disadvantages did not affect this study because the participants were not many and were easy to access. All the interviews were conducted in English because all the participants were comfortable to respond in English.

3.6 Data analysis

Marshall and Rossman (1989) state that after data are collected, a structured meaning should be created through an analysis. Magi (2010) in Mathenjwa (2014:40) argues that data analysis in research includes the breaking, categorising and summarising of data to answer the research question. According to Lodico, Spaulding and Voegtle (2010), data analysis can follow different steps which include, firstly, the preparation and organisation of data. One can organise data according to the site from where it was collected or according to its chronological order (Mohammed, 2016:90). Electronic or audio data need to be converted to text before it is analysed (Creswell 2013).

In this study, data were analysed thematically, following the steps suggested by Maguire and Delahunt (2017). These authors suggest six steps in thematic analysis - (a) familiarity

with the data (b) generation of codes (c) identification of themes (d) review of themes (e) definition of themes and (f) writing-up. Maguire and Delahunt (2017: 3354) indicate that these steps of data analysis are not linear, but a researcher may move back and forth during the process; this happened with the current analysis as well. The first set of data analysed were the documents (pace setter, curriculum document and the textbooks), which I read and re-read in a comparative way to make sense of what they were saying (Maguire & Delahunt, 2017). I purposefully started with the documents to enrich my understanding of their content in preparation for the interviews with the teachers and the subject advisor. The next step was to allocate codes to these documents in relation to the question on how they supported teachers to integrate EE in their teaching. Maguire and Delahunt (2017: 3355) posit that this method of data analysis is theoretical rather than inductive because the researcher analyses the data with the research question in mind. Every time the researcher identified an aspect in the document which was relevant to the research question, I would develop a code and write it with a pencil on the book. For example, some of the initial codes for points from the textbooks were - teaching method, EE content, environmental dimension and teaching place. From the CAPS document and the pace setter, the researcher used fewer codes than from the textbooks. From the CAPS document I identified EE content, environmental dimension and strand, while from the pace setter I only identified, EE content and time allocation, as the initial codes.

The third step was to develop themes by putting together similar codes and identifying common content for each code from the documents to develop a theme. The fourth step on document analysis was to review the themes and so try to make more sense from them by reflecting on how they compared across the documents (Maguire & Delahunt 2017: 3357). This was the stage that led to the presentation of these themes as the findings (see chapter 4.2).

The same process was followed in the analysis of the interviews. These were first transcribed (as suggested by Creswell (2013). The analysis started with the teachers' interviews because they were interviewed first and then the subject advisor's interviews were transcribed. I would begin the transcription immediately after each interview while I still remembered everything the participants said. In the process of transcribing, I would be reflecting on what the participant said and develop codes at the same time. In addition to the codes developed in the documents, more codes were developed from the interviews. These included purpose, guidelines and similar to the analysis of documents, I developed

initial themes, refined them by comparing across the interviews and then decided on the final ones that I presented as the findings.

Steps five and six of my analysis was the discussion of findings and the conclusions respectively. These steps were done by comparing all sets of data to understand what they were saying in relation to the main research question on how teachers are supported to integrate EE in Life Sciences (Maguire & Delahunt 2017: 33511). These steps are presented in Chapter 5 of this dissertation.

3.7 Trustworthiness of the study

Researchers in qualitative research need to attend to four issues regarding trustworthiness: credibility, transferability, dependability and confirmability. This section discusses what these issues mean and how they were addressed in this study.

3.7.1 Credibility

Credibility addresses the idea of how consistent the findings are with reality by means of communication to others on how the research was conducted (Gasson, 2004), however, McMillan and Schumacher (2010:102) did not use the term, 'reality' to define credibility. They referred to the truthfulness of the study as its 'credibility', but Mohammed (2016:92) explains that in establishing the credibility of the study, data are presented not giving information about data. Different scholars such as Lincoln and Guba (1985) suggest different techniques can be used to achieve credibility in a study, including triangulation, peer debriefing, negative case analysis, persistent field observation of the research and the referential adequacy.

This study followed the above mentioned techniques to address credibility. In this study the researcher used peer briefing, wherein I presented my work in progress at students' conferences held at UNISA, every time I got a chance to do so. Member checking was also adopted in this study, wherein participants were given transcripts of their interviews to make sure that what was written was what they meant to say during the interviews.

3.7.2 Transferability

According to Gasson (2004:92), in transferability, a researcher needs to indicate the applicability of his/her research. This ensures that the readers are able to consider whether or not to apply the findings to their own contexts. The researchers need to give sufficient information about the research process. In this study, a detailed description of data

collection is presented to ensure transferability. Also, the sampling strategies and methods are detailed to clarify that the study was not pre-purposed to generalise the findings. During the interview, each participant was recorded so that whatever answers they gave were transferred from audio to written words. Then, the verbatim words of participants were used as far as possible to report the findings.

3.7.3 Dependability

According to Gasson (2004), dependability is about all the steps that show how the study was conducted. Lincoln and Guba (1985) describe 'dependability' as a way of ensuring the reliability of the research. To ensure dependability in this study, the processes that were followed are reported in detail, including the research design and approach, sampling, data collection and analysis methods.

3.7.4 Confirmability

Gasson (2004) argues that with confirmability, the researcher should avoid his/her beliefs or biasness and represent the results of the study the way they are as far as possible. In this study, confirmability is ensured by making sure that the findings of this research were based on the responses from the participants and not my opinions. Every step of data analysis that was made is also outlined. The presentation of findings was also supported by direct excerpts from the participants.

3.8 Ethical considerations

According to Mauthner, Birch, Jessop, and Miller (2002:172), "ethics is the study of good conduct and the grounds for making judgment about what is good conduct". There are several ethical principles that need to be considered when conducting research. These include minimising harm, protecting privacy, respecting autonomy, offering reciprocity and treating people equitably (Mauthner *et al.,* 2002).

This study followed all the ethical principles that include respect for the persons who were part of the study, honesty to all the participants, about the whole research and causing no harm to the participants. I first obtained ethical clearance from the College of Education at UNISA. After obtaining ethical clearance, I sought and received permission from Vhembe district, Mutshindudi Circuit Manager to conduct research in selected schools and with the subject advisor. Permission was then requested from the school principals to conduct research in their schools. It was only after these steps were followed that I requested Life Sciences teachers to participate in the study. The study also received permission from the Circuit Manager to conduct research with subject advisor. I provided the participants with

the details of the aims and purpose of the study and they consented to participate. For the sake of anonymity, a commitment was made to reveal the names of participants and those of schools in which they work, hence, code were used for participants and the schools where they were.

The participants were told about their rights when participating in the research; that participation was voluntary and that they could withdraw at any time should they felt uncomfortable with the whole process. Interviews were recorded with the consent of the participants and they were also informed that the findings for this study would be made available to them should they be interested in them.

3.9 Chapter Summary

In this chapter, the research methodology was discussed, starting with the research approach employed in this study which is the qualitative approach. This was followed with a discussion of the research underlying paradigm employed in this study which was the interpretivism paradigm, together with its ontological and epistemological assumptions. This chapter also outlined the research design used in this study, which is the phenomenological case study design. After the research design, the sampling techniques used in this study, which are the convenience and purposeful sampling were also dealt with.

The methods used in the collection of data - semi-structured one-on-one interviews and document analysis - were also discussed including the steps followed during data analysis. From there, the trustworthiness issues that include - credibility, transferability, dependability and confirmability were also outlined, as well as a description of how ethical issues were addressed during the study. The next chapter presents the study’s findings.

CHAPTER 4: THE RESEARCH FINDINGS

The aim of this study was to examine how Life Sciences teachers are supported to integrate environmental education in their teaching. In chapter 3, the research paradigm, research approach, research design, sampling of data, collection of data as well as the analysis of collected data were discussed. The previous chapter also provided a detailed how trustworthiness was maintained in this study. It concluded by demonstrating how the principles of research ethics were considered and followed in this study.

This chapter presents the findings of the study, the process of which was guided by the research questions outlined in chapter 1 as follows:

How are Life Sciences teachers in the Vhembe District of Limpopo province supported by the Department of Basic Education to integrate EE into their lessons?

Sub-questions:

- How do the subject policy document, books and pacesetters that are supplied by the DBE guide Life Sciences teachers to integrate EE in their lessons?
- How do the subject advisors guide Life Sciences teachers in integrating EE in their lessons?
- How do Life Sciences teachers experience the strategies provided to support them to integrate EE in their lessons?
- What can be done to enhance the support given by the Department of Basic Education to Life Sciences teachers to integrate EE into their lessons?

The findings are presented in two main sets, starting with those from document analyses and then those from the interviews. First, documents analysis was done to understand how teachers are supported to integrate EE in Life Sciences. The documents that were analysed included, the Life Sciences CAPS document for Grades 10-12 and the following books: Focus Life Sciences Teacher's Guide by Clitheroe, Dempster, Doidge, Marsden, Singleton and Van Aarde (2013) for Grades 10 and 12, Solution for all Teachers' Guide by De Fontaine, Marchant, McKay, Freedom, Simenson, Webb and Van der Merwe (2012) for grade 11 and the pacesetter for Life Sciences (Grades 10-12). Secondly, interviews from the participants who were three teachers and one subject advisor. The findings from the interviews were divided into different categories that were then merged to form themes.

4.1 Guidance from documents to integrate EE in Life Sciences

This section addresses the question - *How do the subject policy document, books and pacesetters guide Life Sciences teachers to integrate EE in the subject?* Two themes emerged from the analyses of these documents. These were:

- Environmental responsibility and sustainability through Life Sciences
- Environmental studies as a strand of Life Sciences

These themes are presented as sub-sections below.

4.1.1 Environmental responsibility and sustainability

One of the aims of EE as indicated by DBE (2011) and the prescribed textbook by Clitheroe *et al.,* (2013) is to produce responsible people who are able to take care of their environment. The CAPS document and the textbook both indicate that after learning Life Sciences, leaners will develop "an awareness of what it means to be a responsible citizen" (DBE 2011:8 and Clitheroe *et al.,* 2013). Since the CAPS document is more accessible to teachers than it is to learners, it can be said that it guides the teachers by alerting them towards developing pedagogical practices that promote this awareness and responsibility among learners. The same can be said about the textbooks because learners are guided by the teacher on how to read the book, therefore, if the book stipulates the envisaged outcomes for learners (to be responsible citizens), then it can be said that it also indirectly encourages teachers to teach for this goal.

The pacesetter, on the other hand, does not indicate any aims of studying Life Sciences. What it reflects are - the topics to be covered during teaching and learning and when these should be covered and the dates of assessment – these are just the purpose for which it was developed. The teachers who only rely on the pacesetters, rather than the textbooks and the CAPS document, therefore, stand a chance of missing the information about the need to integrate EE in the Life Sciences curricula because the pacesetters are not meant to guide them on that.

4.1.2 Environmental studies as a strand of Life Sciences

Life Sciences as a subject is composed of four strands, namely, Life at molecular, cellular, and tissue level; Life processes in plants and animals; Diversity, change and continuity; and Environmental studies. These strands are the same for Grades 10-12 as shown in the Figure 4.1 below on the strands that include EE as environmental studies. Table 4.1 indicates different topics on environmental studies which are integrated into Life Sciences from Grades 10-12. What is taught in Grade 11 is a continuation of what has been started in

Grade 10 and emanating from the GET phase. Also, what is covered in Grade 12 in terms of environmental studies is a revision from Grade 11. Similarly, the three analysed documents (CAPS document, textbooks and pacesetter) have the same structures of how to teach environmental studies and it is similar to what has been indicated in Table 4.1 below. The topics covered in Life Sciences about environmental studies include - biosphere to ecosystem, population ecology and human impact on the environment; these are discussed in the following section.

4.1.2.1 Biosphere to Ecosystem

The three analysed documents contain a topic called, Biosphere to Ecosystem, which is covered in Grade 10. The pacesetter only shows this topic and its subtopics, whereas the CAPS document further outlines those topics and simplifies them but without saying how the teachers should teach such topics. The textbook, which is the teacher's guide for Focus Grade 10 teacher's book (Clitheroe *et al.,* 2013:116), provides guidelines on how to teach this topic and how to engage learners on this topic.

The text book for Grade 10 guides teachers to introduce the idea that human beings depend on the environment for resources to sustain their living. In teaching this topic, teachers are also reminded to teach about living things (Biotic) and non-living things (Abiotic). They are guided to do so practically in the prescribed textbook by Clitheroe *et al.,* (2013:116), by asking learners to identify biotic and abiotic thing that they see inside the classroom. For example, on page 116 of the Grade 10 textbook, there is a statement that "*teachers must revise the concepts of biotic and abiotic by asking learners to look around the class and identify all living and non-living things that they see*". This shows that besides listing this topic, the textbook has also gone to an extent of highlighting how this topic should be delivered.

Within this topic of, Biosphere to Ecosystem, there are subtopics that include - the Biosphere, Biomes, Environment and Ecosystem. The CAPS document does not say much about those subtopics other than just listing them with no guidance to the teachers on how to deliver them, however, the prescribed textbook by Clitheroe *et al.,* (2013:117) guides teachers on how to incorporate these contents in Life Sciences curriculum. For example, in page 117 of the Grade 10 textbook, it is said, that "*teachers must at least take learners for study outside of the class and help them identify the biome their school falls under*".

Table 4.1: Life Sciences: Concept and Content Progression

Strands	Life at molecular, cellular, and tissue level	Life processes in plants and animals	diversity, change and continuity	Environmental studies
Grade 10	• Chemistry of life - Inorganic compounds - Organic compounds • Cell - unit of life • Cell division (mitosis) • Plant and animal tissues	• Support and transport systems in plants • Support systems in animals • Transport system in mammals	• Biodiversity and classification • History of life on Earth	• Biosphere to ecosystems
Grade 11		• Energy transformations to support life: photosynthesis • Animal nutrition • Energy transformations: respiration • Gas exchange • Excretion	• Biodiversity - classification of microorganisms • Biodiversity - plants • Reproduction - plants • Biodiversity - animals	• Population ecology • Human impact on environment: current crises
Grade 12	• DNA code of Life • RNA and protein synthesis • Meiosis	• Reproduction in vertebrates • Human reproduction • Nervous system • Senses • Endocrine system • Homeostasis	• Darwinism and • Natural Selection • Human evolution	• Human impact on environment: current crises Grade 11

Source: DBE (2011:10)

Another example can be seen under the section on environment, wherein teachers are informed by the Teacher's Guide and the CAPS document that they must ask learners about how humans affect the environment. This shows that as far as this topic is concerned, the textbook and the CAPS document do give guidelines on how teachers must teach EE in Life Sciences. The pacesetter again does not provide any guidance other than providing a proposed pace to complete the syllabus.

4.1.2.2 Population Ecology

Population ecology is a topic for Grade 11 and it is a continuation of the Grade 10 topic, Biosphere to Ecosystem. There is a noticeable difference in the ways in which the textbook and CAPS have presented population ecology. In the CAPS document, this topic is only

given as a summary, with only the terms or subtopics, without indicating how teachers should teach such subtopics, however, according to the textbook, all the subtopics that are covered in this topic of population ecology also have guidelines on how teachers can introduce them inside the classroom. For example, on page 192 of the Grade 11 textbook, teachers are guided to build their lesson from the prior knowledge of learners by asking them about the environment and the interactions within the ecosystem that they studied in Grade 10. The textbook states, *"In this unit, learners will build on their prior knowledge of the environment and the interaction within the ecosystem that they studied in Grade 10*". It can be concluded that this guideline would enable teachers to introduce this topic in a way that learners can build on. Another example under Population Ecology that shows that the prescribed textbook does guide teachers to integrate EE with Life Sciences is under the subtopic, Interaction in the Environment. In this section, CAPS advises that teachers should go with learners to a local community and investigate about the different interactions in that particular community. This is a guideline that can support teachers to think of ways to integrate EE with Life Sciences, however, the pacesetter does not give any guidelines on how to teach Population Ecology, but it only gives all the topics under Population Ecology and a time frame for when to finish teaching a topic. It can be concluded that the pacesetter only guides on the rate at which one should work to complete a section of a topic rather than on how to teach.

4.1.2.3 Human Impact on the Environment: current crises

The CAPS document states that the topic on human impact on the environment should be completed in Grade 11 but will be examined in both Grades 11 and 12 (DBE, 2011:51). This topic is found in all the three analysed documents (CAPS document, textbooks for teachers and learners plus pacesetter). This shows that teachers in Life Sciences need to teach Human Impact on the Environment so that the learners are able to address the environmental problems they face now and in future, however, the CAPS document does not elaborate on how this topic must be delivered by the teachers. Instead, it only lists the concepts under this topic - the atmosphere, climate change, water availability, food security and loss of biodiversity - with no guidance on how teachers must address them. The textbook, on the other hand provides an overview of this topic of Human Impact on the Environment which contains guidelines on how teachers must teach each content that is included in this topic. For example, on page 322, it states that teachers must teach *"about environmental crises of today that needs to be solved to keep our environment safe for future generations"*. On the other hand, the pacesetter only gives the topics (from the

atmosphere, climate change, water availability, food security and loss of biodiversity to be covered under the topic, Human Impact on the Environment) without stating how they should be covered but only stating the dates on which each must be taught.

After completing the analysis of documents on this question, interviewing the teachers, who are the users of the documents, followed. The interviews were meant to triangulate the analysis to understand the participants' understandings of the guidance, or lack of, from the documents. As an introduction to understanding how the teachers were guided or supported to integrate EE in their teaching, I first asked them to provide their understanding of EE. The following section presents the findings from those interviews.

4.2 Teacher's understanding of Environmental Education

This section provides information about the understanding of EE by the teachers of Life Sciences from Vhembe District in Limpopo Province. The assumption was that teachers' understanding of EE would shed light on whether or not they would understand the guidance on the integration of EE in Life Sciences, from the analysed documents.

When participant 3 was asked about his understanding of EE his response was:

> *My understanding is that EE is an education which is based on the environment outside the class.*

The understanding of EE by participant 3 can be classified under Education in the environment since he mentioned that it is education that is based on the outside environment taking place not inside the class. He further explained that:

> *I can give an example where we are learning about the environment, the plants that we are having, and the types of soil that we are having, the rocks and so on and so on.*

The fact that participant 3 uses the example of learning about the plants, soil and the rocks shows that he sees EE as being about living and non-living things, which falls under the bio-physical dimension of the environment and not these other dimensions such as social, economic and political. To him EE is learning about the outside environment.

According to participant 2, EE is just education that deals with the environment. When asked about his understanding of EE, participant 2 said:

> *According to my understanding, when we talk about EE I think we are dealing with education that deals with the environment.*

His understanding of EE can be classified as education about the environment. When he was asked about what he meant by the word ‘environment’ he replied that:

I think that is the outside environment, the plants and animals, soil, everything.

This understanding of EE can be classified under the biophysical dimension because he mentioned the living an none-living things of the natural environment.

Participant 1 described EE in a similar way with the other two participants. His response was:

> *As for me when it comes to EE, this means that it is all about education and the environment.*

His understanding of EE can be classified under education about the environment because he said that it is all about education and environment which imply that someone is learning about the environment. He further explained:

> *Learners are going to learn on how to take care of the environment. They will also have an understanding on how to keep the environment clean so that they ought to be no disturbance in the environment.*

This participant showed an understanding of the relationship between the environment and the humans and of the responsibilities that the humans have for the environment. This understanding can be challenged on the grounds that it subordinates the environment, however, it is still commended in that the participant realises that learners should be taught to be responsible towards the environment.

When Participant 2 was asked whether he practices EE with his learners, his response was as follows:

> *Yes, I do go outside when, let us say, I am dealing with plant diversity, so that they can check or see the trees practically rather than focusing on theory only. They have to go outside and see the types of plants that we are referring to.*

Participant 2 also understands EE as doing practical outside of the classroom, and this understanding can be classified as similar to that of participant 3 which is under education in the environment. This response falls under the biophysical dimension.

4.3 Life Sciences teachers' experiences regarding the support to integrate Environmental Education into their lessons

This section addresses the question - *How do Life Sciences teachers experience the strategies provided to support them to integrate EE into their lessons?* This question was first asked in relation to the analysed documents (see section 4.2 above). The participants were asked about how EE was included in the documents. This section will begin by presenting their responses to this question before indicating their experiences or views about whether the books supported their teaching of EE or not.

4.3.1 The inclusion of Environmental Education in Life Sciences as a subject

Life Sciences Teachers in this study were asked about the inclusion of EE in the analysed documents (CAPS document, textbook and pacesetter). This was to see how teachers experience the content of these documents and also how they view these documents in relation to the research question. This theme was composed of two categories which include EE in CAPS document, textbook and pacesetter and also EE topics in the CAPS document, textbook and pacesetter.

4.3.1.1 Environmental Education in the CAPS document textbook and pacesetter.

The CAPS document states that as a curriculum policy, it "must be used together with textbook and pacesetter", hence, the participants were asked about the documents that they used during the teaching of Life Sciences. Participant 2 indicated that:

… a lesson plan has to be there it goes with pacesetter and the CAPS document and obvious with the study guides that I use.

This shows that participant 2 does use the CAPS document when teaching EE. On the same question of what documents they use in teaching of Life Sciences, participant 1 replied that:

Normally I use textbooks and study guides.

The finding on this question shows that teachers do use the mentioned documents since participant 1 and 2 indicated that they use CAPS document, pacesetter and textbooks.

To further breakdown the analyses of the main question in this section, teachers were also asked about how EE is included in the CAPS document, pacesetter and the textbook. Their responses were as follows,

I can say there are some connections. [EE] is there in Life Sciences curriculum policy because there are certain concepts in Life Sciences that deal with environment. For example, human impact on the environment is there so it is incorporated in Life Sciences policy documents. (participant 2)

The response shows that participant 2 knows that EE is in the above analysed policy document, however, participant 1 had a different opinion:

The unfortunate part of it is that I do not have the CAPS document with me wherein I can read and interpret it for you.

This response showed that participant 1 can only interpret how EE is included in the CAPS document, only if he had the CAPS document with him.

Furthermore, participants were also asked about how often they use the CAPS document, pacesetter and prescribed textbooks when teaching EE in Life Sciences. Participant 2 replied that:

I often use CAPS document, every time when I start a new topic, I usually browse around the CAPS document together with the pacesetter, so that I can see if they correspond together.

The fact that participant 2 said that he *"browse around the CAPS document"* could mean that he does not necessarily use the CAPS document to get guidance on how to integrate EE with Life Sciences but to compare the CAPS document with pacesetter to see the correspondences.

When participant 1 was asked about how often he uses the CAPS document when he teaches Life Sciences, he responded, "*Once in a year".* This shows that participant 1 does not often seek for guidance from the CAPS document since he opens it once a year. When asked why he opened the CAPS document once a year, participant 1 further replied that:

It is just because I prepare my own teaching notes for the whole year and use them to teach throughout the year without going to consult the CAPS document and textbooks again.

This response from participant 1 shows that he does use the CAPS document when he prepares to teach, but not very often since he mentioned that he uses it once a year to prepare and make his own notes for the whole year.

When asked about how often he uses the CAPS document, participant 3 responded that:

Maybe once a week, or maybe once in two weeks I just read, like I have said before that I do not have time. You find out that sometimes visiting the CAPS document takes time and you find out that you do not even have enough time, but I know that EE is there.

Participant 3 complained that time allocated hinders him from visiting his CAPS document regularly, but he knows that EE is found ine the CAPS document for Life Sciences. This comment suggests that the participant does not blame lack of support from the document for the integration of EE in the practice, but on lack of time. The pertinent question here is, what the teacher uses to prepare if he does not have time to read the necessary documents.

4.3.1.2 Environmental Education topics in Life Sciences

Biosphere to Ecosystem in Grade 10, Human Impact on the Environment in Grade 11 and 12 and also Population Ecology in Grade 11 are the EE topics found in Life Sciences under the strand of environmental studies as described in the CAPS document, pacesetter and prescribed textbooks (see Section 4.2). In this category, teachers were asked about their understanding of the inclusion of EE topics in Life Sciences.

Participant 1 was asked which EE topics are covered in Life Sciences and he replied:

I think it is included because we also learn about human impacts on the environment, meaning that if its human impact on the environment, this means that EE must be applied also.

Participant 1 started his response by *"I think.."* which indicated some uncertainty about the topic, however, he managed to mention one EE topic in Life Sciences that is covered in Grade 11. When he was further asked if Human Impact is the only EE topic in Life Sciences his response was,

I think so… because the only EE topic that I am familiar with in Life Sciences is human impact on the environment. That's the only topic that I know that it deals with the environment.

This response shows that participant 1 regards Human Impact in the environment as the only EE topic that is found in Life Sciences, hence neglecting other topics, such as Population Ecology and Biosphere to Ecosystem, however, participant 3 said that there were topics in Life Sciences and when asked the same question, he responded thus:

Global warming, greenhouse effects and also photosynthesis also including human impact on environment.

Participant 3 mentioned some of EE topics that are found in Life Sciences as compared to those that are found in the CAPS document and that is Human Impact on Environment (see Table 4.1). When participant 2 was asked about the inclusion of EE in Life Sciences he mentioned that there is a connection, when asked about the EE topics in Life Sciences, he said that:

I know that the only EE topic in Life Sciences is human impact on the environment and it covers a lot of environmental aspects and helps people to know how to take care of the environment.

Participant 2 only mentioned one EE topic that is found in Life Sciences which is Human Impact on the Environment. This response is no different from the above responses by participants 1 and 3, therefore, this response from all three teachers shows that they did not have a full understanding of EE topics that are found in Life Sciences curricula.

These interviews about the inclusion of EE in Life Sciences showed that all three interviewed teachers only see Human Impact in the Environment as the EE topic that is found in Life Sciences, neglecting other EE topics, such as Biosphere to Ecosystem and Population Ecology. The question still to be answered is how they viewed the documents in terms of support towards EE integration.

4.3.2 Life Sciences teachers' experience regarding support from the CAPS document, pacesetter and the textbook integrating EE in their subject

It was interesting to find that the teachers regarded some of the documents as supportive in integrating EE in Life Sciences even though their responses to the other questions above had indicated a limited understanding of the EE topics. For example, in response to the question on the support of the CAPS document towards integrating EE in Life Sciences, participant 2 responded:

I would say the CAPS is very much important and helps me to teach EE in Life Sciences, because it contains important concepts that Life Sciences teachers should focus on … for example, if I am teaching biodiversity, there will be guide lines on how I should teach it and what to focus on.

The response from participant 2 shows that he found the CAPS document helpful in integrating EE into Life Sciences lessons. This response concurs with my analysis of the CAPS document in section 4.1.

The view of participant 1 about the CAPS document was similar to that of participant 3, that it does guide him to integrate EE in Life Sciences. When he was asked to explain how it guides or support him, he stated:

> *The CAPS document is simplified and there are instances where you find out that the concepts are simplified and once more you will realise that everything is there in the CAPS document as opposed to the document that were used during the previous curriculum which is OBE.*

Participant 2 gave a perspective on the applicability of environmental content in the CAPS document.

> *[The CAPS document] guides me on how to connect practical part with theory part, though the information is not that deep … there should be more examples on how to link EE theory with practical, since we as teachers mostly make our own examples not from the textbooks.*

This response concurs with my analysis of the contents of the CAPS document does not provide enough guidance to the Life Sciences teacher.

In addition, the participants had similar experiences about the pacesetter as my findings from the analysis of this document. When asked if the pacesetter supports them to integrate EE in Life Sciences participant 3 said,

> *I cannot really say it has guidelines on how to teach EE in Life Sciences because it only outlines the topic, then I have to go to the textbook in order to get guidelines and content to support me in teaching that topic.*

This response proved that my assumption that the pacesetter might be regarded as helpful in supporting the integration of EE was not true, as far as this participant was concerned. Participants 1 and 2, however, regarded the pacesetter as very helpful in this regard, but when asked to elaborate on this view both stated the time scheduled in the pacesetter as the support. Participant 1, for example, said, *“In the pacesetter you can find dates that tell*

you when to teach a topic or a subtopic, so this helps on when to start teaching a topic and when to finish it". Similarly, participant 2, *"I would say that it supports in the sense that it indicates time lines that I must focus on when teaching a topic".* In other words, these participants regard the time scheduled in the pacesetter as a guidance in itself, which is a different perspective to that of participant 1 and mine. This was an interesting difference in views about this document.

The three participants were also asked what they thought was the purpose of the pacesetter in teaching and learning of EE in Life Sciences. While participants 2 and 3 stated time framing as the purpose of this document, participant 3 maintained that its purpose was:

> *To guide me on what to teach and to pick topics from the textbook, since I do not have to teach the whole book.*

From the three interviewed participants there is no one who mentioned how the pacesetter supports teachers to integrate EE into Life Sciences.

Regarding the textbooks, the teachers seemed to be happy with the guidance they provide for the integration of EE in Life Sciences. Participant 3 even specified the sections of the textbook where such guidance is located.

> *Yes … in the beginning of a chapter they indicate that when introducing this topic this is how you are supposed to do it and they also show how to link that topic to the next topic.*

Similarly, participant 2 stated,

> *Yes, I would say [the textbooks] support in teaching EE in Life Sciences in the sense that textbooks contain theory and also guidelines on how to apply that theory in real world when teaching about EE topics in Life Sciences.*

Overall, all three interviewed teachers said that the textbooks contain guidelines for teachers on how to integrate EE in Life Sciences. These views concur with my analysis of the documents.

It was interesting that participant 1 saw the interconnectedness of the three documents and the usefulness of all three. He commented:

> *I have to go to the pacesetter and see which topic I have to teach in which date, then I go to the CAPS document on how to teach that topic. Then I go to the textbook and make notes looking at the content and following the guidelines from the textbook combining them with those from the CAPS document then after that I go and teach.*

The response from participant 1 shows a great example of how one can use all the three documents together to get clear guidance on how to teach Life Sciences.

4.4 Subject advisor's role in the integration of Environmental Education in Life Sciences

This section provides the information addressing the question - *How do the subject advisors guide Life Sciences teachers to integrate EE in their subject?* This section starts by addressing the question of how the subject advisor understands EE. This question was asked with the assumption that the subject advisor would not understand the guidance he provided to the teachers in this regard, if he did not understand EE. The next question was how the subject advisor supported teachers to promote the integration of EE in Life Sciences.

4.4.1 Subject advisor's understanding of Environmental Education

The subject advisors understanding of EE was essential in this study because, as indicated, it was assumed that the subject advisor's understanding of EE would influence his response on how he was supporting the teachers to integrate EE in Life Sciences. When asked about his understanding of EE, the subject advisor (participant 4) responded: "*Mostly it is the impact and the interaction between living and non-living organisms".*

His understanding of EE can be classified under the dimension of education for the environment because he emphasised how living and non-living organisms interact with each other. Furthermore, participant 4 said:

> *I think what is needed is that our curriculum must include the study of components of the environment and how they are affected.*

When he was asked to mention the components of the environment that he meant, his response was that:

It is the plants and animals, the soil, the economy, jobs and also the way we take care of or environment not forgetting how our leaders use the environment to benefit the country.

It was interesting to find that the participant understood the term, 'environment', in its totality – mentioning all its dimensions from the bio-physical, social, economic and also political. This response gave me hope that the participant would then ensure that the teachers under his leadership would also understand the environment the same way and that they would provide relevant pedagogical practices to encompass these dimensions of the environment. The next question, therefore, was how he supported the teachers to integrate this knowledge in their teaching.

4.4.2 The subject advisor's support in the integration of EE into Life Sciences lessons

This section addresses the question - *How do the subject advisors guide Life Sciences teachers to integrate EE into their lessons?* To simplify this question, the participant was asked how he supported teachers through visit schools, providing resources or any other necessary support he deemed necessary for EE integration into Life Sciences lessons.

4.4.2.1 Support by subject advisor

When asked about how he supported teachers to integrate EE in the subject, participant 4 replied:

The problem is that when we look at the [DBE], it is results-oriented. We do not look at the longer impact that we [make]. It is just a matter of all nine provinces competing for the first position during final examinations, such that we find that the impact of saying the subject is being taught and find *its results in real life, you can find that there is none. So, I can say we are not doing enough to support teachers to integrate EE in their subject.*

The response from participant 4 indicates that the wider educational environment under which he works dictates the practices he might recommend. As such, he is not able to provide the necessary support to the teachers concerning the integration of EE in Life Sciences. His work is only responsive to the competition between the DBE and the general education system. In other words, he shifts the responsibilities of supporting teachers to integrate EE to the DBE. He further indicated that his main concern is the performance of

learners in the subject rather than the pedagogical practices in particular sections of the curriculum.

He stated:

> *As I am, I cannot go out and say I am going to support a teacher on EE, without seeing how learners have performed, and the performance of the learners in a section does not mean that they understand it because we do teach them being exam oriented.*

This was an interesting response that indicated that exam-orientation may produce ignorance of the content and process of teaching and learning. It leaves a question on the role of examination in the actual learning towards the purpose of EE. This response from participant 4 shows that only teachers whose learners do not perform well in the section of environmental studies may be supported on how to integrate EE in Life Sciences, therefore, those who perform well are neglected. It was significant to find that these responses from participant 4 are blaming the DBE because one would assume that the subject advisors compose a large component of what the DBE is.

4.4.2.2 Reactive support from subject advisor

The study found that the support of the subject advisor was reactive and non-specific. In other words, the advisor would have to identify the non-integration of EE as a problem before he would offer support in that regard. When asked about how often he visited schools to support EE in Life Sciences, participant 4 responded that:

> *Yes, we do go for visits. We are field workers. We work outside for monitoring and support. So, it means that I will go there, and I identify the problem and then I will support on the problem I found, but you might find out that the problem is not on EE. Then we support where the problem lies. So, we go out there and support Life Sciences as a subject not EE as a section.*

This response shows that if a teacher did not integrate EE in the subject, the advisor did not see that as a problem, then there would be no such integration. The support from the subject advisor was not specific to EE. The visits are on topics that give teachers problems and areas where learners do not perform well which may or may not be on EE. Advisors do visit school, not specifically for EE as a section, but for Life Sciences as a subject.

According to participant 4, a visit for EE can arranged only if they diagnose a problem, on such a topic in EE. He further said, "*A visit is given in schools but not for this topic of EE.*

But if we find problems in this section of EE, for example in human impact, then we do address that."

This shows that for a visit to be arranged to support an EE topic, he would have to first see if there was a problem or not – and that problem would be about learner performance rather than anything specific to EE. This can lead to lack of visits for EE support, if the school performance in Life Sciences is good.

4.4.2.3 Resources from subject advisors

When asked if there were specific EE resources to support teachers to integrate EE in Life Sciences, participant 4 replied:

> *Our department is currently out-resourced. There are no resources. The issue being that, since now, we are not resourced in many things just because if we talk about Life Sciences we are supposed to have a centre wherein all Life Sciences curriculum advisor in Vhembe were to be found there to work as resource persons.*

This shows that there is a shortage of resources that can be used to support teachers, in the District, who cannot integrate EE in Life Sciences. From these findings one can conclude that the subject advisor does not support teachers to integrate EE in Life Sciences, although, he indicated that he visited schools to diagnose and provide support on identified problems; no mention was made of the lack of integration of EE. The reason for this was implied as being related to the examination-focused approach to teaching and learning, which is caused by the competition generated by the general education system.

4.4.4 Teachers experiences of the support they receive from subject advisor

This section provides information about how teachers experience the support provided to them, by the subject advisor, to integrate EE in Life Sciences. To simplify the question on how teachers experience the support they receive from the subject advisor on integrating EE in Life Sciences, this section was divided into parts - first, school visits by subject advisors and secondly, the resources that the subject advisor provided to support teachers with the integration of EE into Life Sciences.

4.4.4.1 Experiences regarding the subject advisor's visits

Most, if not all, teacher participants indicated that they were not visited regularly by the subject advisor. When participant 1 was asked about how often he received visits from the subject advisor, his response was,

> *I do not know whether it is because of the area I am in; I came here in 2011. Since then, I only received one visitation from the subject advisor. But, the time he came here, it was only the resources that [that I received] from the subject advisor.*

This shows that the subject advisor had not visited the school for more than seven years, let alone to support the teacher about EE.

When participant 2 was asked the question about the kind of support he received from his subject advisor, his response was:

> *I cannot really say I get any support from the subject advisor regarding EE … In most cases when the subject advisors come, they usually focus on the performance of the subject. So, there is no support or resources of that nature that I receive from the subject advisor.*

This response corresponded with the subject advisor's statement that his visits were related to learners' performance in the subject. Participant 2 further highlighted that subject advisors do not visit him very often. When he was asked how often the subject advisor visited to offer support and on EE, his response was:

> *Since I started teaching I think they only came this year (2019) since 2015, coming to school for Life Sciences only. They only came this year (2019) since 2015 although we do have some workshops we go to for Life Sciences, but personally they only came once for Life Sciences.*

From the response of participant 2, it is clear that there are limited visits by the subject advisor. This response also shows that when the advisors come to the school, they come for Life Sciences as a whole subject and not for EE, a topic in Life Sciences.

4.4.4.2 Resources for EE from subject advisor

This section responds to the type of resources teachers received from the subject advisor to support them to integrate EE in Life Sciences. When participant 1 was asked about the types of resources that he received from the subject advisor to support him to integrate EE in Life Sciences, he responded, "*The resources he provided were the textbooks only".* When

asked about what other resources he would expect from the subject advisor, participant 1 replied:

> *Teaching Life Sciences requires materials like, posters, models, access to ecosystem, TV, and textbooks. So, what I was expecting is those materials, but what I got was only a textbook*.

Similarly, participant 2 also pointed out that there is a shortage of resources when it comes to doing practical in EE and other sections in Life Sciences as a subject. When asked about the type of resources that he need to teach the topics, he responded:

> *There is usually a shortage of resources when it comes to doing practical in Life Sciences. But I do make a plan so that I can be able to teach that particular concept.*

It was interesting that Participant 2 realised his role of 'making a plan' as a teacher rather than to rely solely on the subject advisor for the required resources.

It can be concluded from these responses that there is lack of resources from the subject advisor to support teachers to integrate EE in Life Sciences lessons.

4.5 Chapter Summary

In this chapter, the findings of this study were presented. First to be presented were data from the analysed official documents that included the CAPS document, pacesetters and prescribed textbooks. Secondly the data collected through the semi-structured interviews were also presented. The aim of this study was to explore how Life Sciences teachers in Vhembe District of Limpopo Province are supported by the DBE to integrate EE in their lessons.

The next chapter presents the summary of the findings, discussions, recommendations and conclusions of this study.

CHAPTER 5: DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The aim of this study was to explore how Life Sciences teachers in the Vhembe District of Limpopo Province were supported by the DBE to integrate EE into their lessons. In chapter 1, it was stated that EE has an important role in developing citizens who can manage the environment, sustainably. I argued that schools could play a crucial role in facilitating the achievement of this role through the integration of EE in all subjects, as also mandated by the South African government. Literature that was reviewed for this study, however, suggested that, for various reasons, teachers were not integrating EE in their lessons (see Chapter 2). This study adopted the phenomenological case study design to look at the experiences and perspectives of teachers regarding the support they receive on integrating EE into Life Sciences lessons. Data were collected through document analyses and semi-structured face-to-face interviews, which were then analysed thematically.

The study's findings were presented in Chapter 4 and this chapter discusses those findings and provides conclusions and recommendations. The chapter begins by summarising the findings in relation to the research questions. This summary is followed by the discussion of findings in relation to the literature that was reviewed in Chapter 2 and the theoretical framework, thereafter, conclusions and recommendations are presented.

5.1 Summary of the findings

The main research question of this study was - *How are Life Sciences teachers in Vhembe District of Limpopo supported by the DBE to integrate EE into their lessons*? This main question was divided into four sub-questions. These questions were:

- *How do the subject policy document, textbooks and pacesetters that are supplied by the DBE guide Life Sciences teachers to integrate EE into their lessons?*
- *How do the subject advisors guide Life Sciences teachers in integrating EE in their lessons?*
- *How do Life Sciences teachers experience the strategies provided to support them to integrate EE into their lessons?*
- *What can be done to enhance the support given by the DBE to Life Sciences teachers to integrate EE into their lessons?*

The summary of findings in this section is presented in accordance to these four sub-questions, however, the last sub-question was answered in the recommendations that the study is providing.

5.1.1 How does the policy document (CAPS) and textbook supplied by the DBE guide Life Sciences teacher to integrate Environmental Education in Life Sciences lessons?

The findings suggested that the CAPS document and the textbooks analysed provide some guidelines on how teachers can integrate EE in their lessons, whereas the pacesetter does not provide any guidelines. It can, hence, be said that teachers who regularly use the CAPS document and the textbooks can find them helpful in the integration of EE into Life Sciences lessons.

5.1.2 How do the subject advisors guide Life Sciences teachers in integrating Environmental Education in their lesson?

The subject advisor does not support teachers in the integration of EE in their teaching. What the subject advisor focuses on is the performance of the learners in the subject as a whole and not necessarily on the sections related to EE. Overall, there is lack of support on content, pedagogy and resources. The subject advisor sometimes provides a reactive rather than proactive support to the subject teachers (see section 4.4.2).

5.1.3 How do Life Sciences teacher experience the strategies provided to support them to integrate Environmental Education into their lessons?

There were mixed reactions regarding the manner in which the existing documents support or guide the integration of EE into the teaching and learning of Life Sciences lessons. The findings indicated that participant 2, a Life Sciences teacher does not make time to read the documents that contain strategies to help him to integrate EE in his lesson. His perspective, therefore, was that the documents do not support in integrating EE into the lessons. Participant 3 regarded the content in the documents as a guidance and even indicated how the three documents could be used together for a better preparation to teach EE in Life Sciences, however, all three Life Sciences teachers experienced a lack of support from the subject advisor.

5.2 Discussion of the findings

This section provides a discussion of findings in relation to the literature reviewed in chapter 2 and the theoretical framework.

5.2.1 Support to teacher to integrate Environmental Education in Life Sciences

In Chapter 2 of this study, literature indicated the need for teachers to read the policy documents to make meaning from them (Zwelibanzi, 2016; Mbatha, 2016). Similarly, the researcher's application of the ecological system theory in this study suggested that teachers should have knowledge from the policy documents since such knowledge is essential during the teaching and learning of EE inside the classroom, a micro-system. Some of the findings from this study, however, contrasted with this suggestion because they show that some teachers do not adequately read these necessary documents. As a result, they are not informed of the support that the CAPS document and the prescribed textbooks provide towards the integration of EE in Life Sciences. This finding concurred with Nhlongo's (2015:90) study where teachers were found to have not been reading the policy documents and as such failing to give the curriculum aims, objectives and outcomes of teaching environmental education.

One of the questions was how subject advisor support Life Sciences teachers to integrate EE in their lessons. Literature in chapter 2 indicated that if the subject advisors do not play their role in supporting teachers to integrate EE, teachers will not be able to do so (Monde, 2012; Mwendwa, 2017; Zwelibanzi, 2016). Similarly, Teane (2007:54) recommends that "teachers must get support from subject advisors who must ensure that teachers are implementing new curriculum in their classrooms". Hindoingo (2013) and Mbatha (2016) add that it is a mandate from the government for subject advisors to support teachers experiencing problems. In view of the application of the ecological system's theory to this study, the subject advisors are the meso-system who must support teachers to integrate EE in their subject, however, this part of the system does not seem to support the whole system because the subject advisor is not doing much to support teachers. Instead, the subject advisor shifts the responsibility of supporting teachers to integrate EE to the DBE. This finding suggests that the subject advisor regards himself as not part of the DBE, which was an interesting finding that raised a question of who the DBE is.

Literature in chapter 2 also indicated a lack of school visits from subject advisors for Sciences in Vhembe District in South Africa (Tshiredo, 2013; Schudel *et al.,* 2008). In her findings, Teane (2007) reveals that "subject advisors in Temba school District in South Africa visited schools once a year" to support them in EE. Similarly, the findings from this study shows that subject advisor do not visit schools as often as required to support teachers on the integration of EE. The subject advisor was only concerned with executing the mandate of the DBE which was examination-related rather than learning-oriented.

Teachers are only geared to compete with other provinces for the final matriculation examination results. This competitiveness makes subject advisors to focus more on how to support teachers in making learners to pass rather than to learn particular aspects of the curricula. This finding is a challenge to the goal of EE regarding “providing every learner with opportunities to acquire the knowledge, values, attitude, commitment and skills needed to protect and improve the environment” (Loubser *et al.,* 2014:47). This raises a question of whether education is about examination or about learning, which is a serious concern if the environment and the people are to interact sustainably.

For teachers to be supported well in integrating EE into their lessons, subject advisors need to visit them in their respective schools to support and to support them (Haindongo, 2013:177). The findings from the study, however, showed that school visits by the subject advisor is influenced by how learners have performed in Life Sciences as a subject not on EE-related topics only. As such, schools that perform well in Life Sciences might not be visited at all. The subject advisor, therefore, will not be aware if there are sections of the curriculum that are ignored in the process of teaching and learning. This situation limits the possibilities of integrating EE in Life Sciences. The teachers in this study complained that they had been working for a long period of time with no visit from the subject advisor. One of the teachers indicated that he has worked for eight years with only one visit from the subject advisor to support him. This lack of visit by subject advisor shows that those teachers who do not integrate EE in their subject will never get support to do so. This finding concurs with the study from scholars such as Mathenjwa (2014), Haindongo, (2013) and Schudel *et al.,* (2008) who also highlighted limited visits by subject advisors for EE specifically.

Resources are considered to be a significant aspect in supporting teachers to integrate EE in the subjects. Monde (2012), Kimaryo (2011) and Zwelibanzi (2016) indicate that one of the problems that lead to lack of implementation of EE was lack of resources. Similarly, the findings from this study shows that subject advisors do not provide teachers with necessary EE-related resources to support them to integrate EE in their subject. The subject advisor also shifted responsibility to the DBE, saying that the DBE is under-resourced and unable to support teachers in teaching Life Sciences. In this study the DBE is regarded as an exo-system which is supposed to provide resources for effective integration of EE in Life Sciences at the micro-system level. Haindongo (2013) and Mwendwa (2017) indicate that teachers need to be supported with resources to implement EE in their lessons, however, there is no supply of such resources, neither from meso-level or the exo-level of the system. This is regardless of the findings from Zwelibanzi (2016:157), Monde (2012), Kimaryo

(2011) and Mwendwa (2017) who all posit that if “teachers are to teach EE well, they need to be well equipped and be supported by resources”.

5.2.2 Subject advisor and teachers’ understanding of the environment and Environmental Education as a factor

This study was premised on the notion that the subject advisor’s understanding of EE would have implications on how he might support teachers to integrate EE in Life Sciences. This notion was also backed up by literature. For example, in Chapter 2 of this study, Haindongo (2013) highlights that lack of understanding of EE and environment by subject advisors limits the possibility of support for teachers. Zwelibanzi (2016), Monde, (2012) and Mwendwa (2017) also state that most subject advisors lack understanding of EE and the environment because they were not trained. On the contrary, the subject advisor in this study seemed to have an advanced understanding of what the environment is comprised of (see section 4.4.1). The problem is that his understanding of the EE cannot be transferred to the teachers because he does not interact with them to share this information.

In consideration of EE as education about, in and for the environment (Lucas, 1972; Melville 2007; Loubser, 2012; Kimaryo, 2011), the findings show that, although, the subject advisor understands the environment as comprised of bio-physical, social, economic and political dimensions (Kimaryo, 2011:25; Loubser *et al.,* 2014:146), his reference to EE was more focused only on education about the environment. This finding suggests that he understands the need for education about the environment but does not do much to see this need satisfied. In addition, the teachers’ limited understanding of the environment (and EE) as compared to the subject advisor is exacerbated by the problem of limited interaction between the subject advisor and the teachers.

Teachers understand EE as education about the environment, with one understanding it as education in the environment. These understandings of EE show that teachers are not fully aware of the other dimension of EE, education, “in” and “for” the environment. This lack of comprehensive awareness suggests a limited possibility for teachers to teach responsibility towards the environment. This finding concurs with scholars, such as Makhoba (2009) who said that teachers do not understand all the dimensions of EE and they find it hard to integrate EE in their subjects, even when supporting resources are available.

Teachers also have a limited interpretation of the CAPS document and the textbooks in relation to the content about EE. They referred only to the topics about the Human Impact on the Environment. This limitation can make teachers not to pay much attention to teaching

EE through the other topics of Life Sciences, such as Biosphere to Ecosystem and Population Ecology. This way, teachers may not realise the support offered in these documents towards the integration of EE in the subject. The findings are similar to Mathenjwa's study (2014) where teachers lacked pedagogical content knowledge because they did not know how to implement EE in their subjects and they were not supported in the implementation of EE across the curriculum. The participants in this study were also found not keen to read the available documents as available resources for the practices. As such, they were not able to identify the EE content in these documents.

5.2.3 Lack of Environmental Education training

According to Chi-Hung Ko and Chin Kin Leo (2003), lack of training in EE inhibits teachers from integrating EE into their subject. Similarly, in a study by Monde, (2012) about the barriers to successful implementation of environmental education in Zambian high schools, it was also indicated that lack of training for EE teachers inhibits them from producing learners who will be able to take care of their environment. The findings from this study share sentiments with the findings from both Monde (2012) and Chi-Hung Ko and Chin Kin Leo (2003) because they also show that teachers do not integrate EE in Life Sciences because they lack EE training. All three teachers from this study have indicated that they have not received any EE-related training from the DBE, since they started working. The finding from Kimaryo (2011) indicates that lack of EE training leads to lack of integration of EE in the curricula, therefore, there is a gap in the system, with the exo-system (DBE) not providing necessary support to the other levels of the system, (the meso- and micro-) which in the case of this study, will be supporting teachers and the subject advisor with EE-related training. This finding concurs with other studies conducted by different scholars, such as Mwendwa (2017:9) who states lack of teacher training as an obstacle to EE integration in schools.

5.3 Conclusions

Three conclusions can be drawn from this study. These conclusions are about the following issues: the responsibility of the subject advisors, the responsibility of teachers and the role of documents in integrating EE in Life Sciences.

5.3.1 The responsibility of the subject advisors regarding the integration of Environmental Education in Life Sciences lessons

This study concludes that, if the goals of EE as stipulated in various international resolutions (such as Tbilisi principles of EE and the NGO forum principles) and national documents (such as White Paper 1 of 1995 and the 1989 White Paper of EE) are to be achieved, it is essential that the subject advisors support teachers in the integration of EE pedagogical practices. Presently, this support is limited in the context where this study was conducted. This is because findings from this study show that the DBE, through the subject advisors were not supporting teachers to integrate EE in their lessons. The literature review in this study indicated that teachers are not integrating EE in their lessons because there is poor support from the DBE to support teachers to integrate EE in their lessons. It also transpired from the theoretical framework of this study that there is poor integration of EE in Life Sciences because there is no connection between the persons whom the integration of EE relies on; teachers (micro-system) who are the ones to integrate EE are not supported by the subject advisor (meso- system) and the DBE (exo-system) to integrate EE in their lessons. The subject advisors, therefore, have a crucial role to play in supporting, not only the teachers, but indirectly the learners to be informed citizens for, in and about the environment.

5.3.2 The teachers' responsibility regarding the integration of Environmental Education into Life Sciences lessons

This study concludes that the teachers are not taking enough responsibility to support themselves in the integration of EE in Life Sciences pedagogies. This limited responsibility is due to limited reading, focusing on examination results rather than subject content and transferring of responsibility to the DBE. These reasons also result in teachers not realising the need to familiarise themselves with the content and practice of EE, however, this study concludes that the teachers' responsibility in this regard is closely linked to training in the subject. EE-related training for both teachers and subject advisors is necessary for the improvement of integration of EE in the curriculum. Teachers in this study indicated that they have never had the necessary training about the integration of EE in Life Sciences, thus, it can be concluded that the extent of the teachers' responsibilities is dependent on whether they have information or not in this regard.

5.3.3 The policy documents and textbooks on the integration of Environmental Education in Life Sciences pedagogies

Based on the findings drawn from this study, it can be concluded that the support provided in the CAPS document and the textbooks of Life Sciences is relevant, only if teachers are able to identify and utilise it. In the case of the participants, there is no conclusive stand on the support given by these documents in the integration of EE because of two reasons - first, some participants are ignorant about the content related to EE integration because they do not read these documents; second, there is no encouragement from the DBE for teachers to refer to the CAPS in relation to the integration of EE. The focus is on the aspects of curriculum that are often in the examinations and EE does not necessarily form a large part of these.

5.4 Recommendations

Teachers in this study experienced lack of support in the integration of EE from the subject advisor and also because they lack time to prepare and read curriculum documents. Having presented and discussed the findings of this study in the previous chapters, this section presents the recommendations of this study starting with the recommendations made by participants in response to the question - *What can be done to enhance the support given by the DBE to Life Sciences teachers to integrate of EE in their lessons?* Both the teachers and subject advisor recommended the following:

5.4.1. Recommendations from teachers and the subject advisor

5.4.1.1 Time allocation

The teachers recommended that the time allocated for Life Sciences in schools must be increased so that it can accommodate the integration of EE in the pedagogical practices of Life Sciences. More time is needed so that teachers can go outside to the environment and teach learners in the environment, about the environment and for the benefit of the environment. The addition of extra time will support teachers to have enough time to prepare and be able to integrate EE into their lessons. It can, therefore, be said that there is a need to re-structure schools' time tables.

5.4.1.2 Environmental Education field trips

The teachers recommended that leaners should be taken on school field trips. Those trips need to be conducted in such a way that they help teachers and learners to be exposed to

the environment that they cannot find in their respective areas where the schools are located. This recommendation was also supported by the subject advisor when he mentioned that “field trips will help in identifying biomes that are there in South Africa”. In addition, therefore, to the required additional time for teaching and learning in schools, there must be enough resources for field trips.

5.4.1.3 Environmental Education-based workshops

Participant 2 recommended that the DBE must conduct EE-based workshops to support teachers on how to integrate EE in the teaching and learning of Life Sciences. These workshops will also bring awareness of teachers about how EE can be included in Life Sciences.

5.4.1.4 Environmental Education as an independent subject

The subject advisor recommended that EE must be made a subject on its own. He said that the DBE must find a way to make EE an independent subject, since it will give “EE a bigger scope rather than for EE being a portion in Life Sciences”. This will enable subject advisors to have enough time to support teachers in the teaching and learning of EE.

5.4.2 Further recommendations

In view of the findings presented in Chapter 4 and discussed above, the following recommendations are made:

- Findings from this study showed that teachers do not ready the CAPS document as much as they should in order for them to find support on integrating EE into their lessons. Therefor, this study recommends that the planning of Life Sciences curricula must have aspects that mandate teachers to read the CAPS and other documents so that they become aware of all aspects in the documents. This inclusion may enhance the integration of EE in the pedagogical practices of the teachers.
- The findnings from this study shows that subject advisor does not support teachers to integrate EE in the teaching of Life Sciences. Therefore, this study recommends that

the subject advisors should support teachers who struggle to integrate EE into their lessons on a regular basis. The support should not be focused only on examinations but also learning.

- Findings from this study also shows that teachers do not take EE seriously because it is not examined like other sections of Life Sciences. The recommendation is that the examinations must have sections about EE so that, the teachers may take integration seriously, as they do with other sections that get examined.
- Subject advisors must support teachers in all topics covered in Life Sciences. Their support must be proactive rather than reactive. This is because the findings of this study reflects that subject advisors only support teachers on topics that learners do not perform well.
- The findings from this study shows that there is shortage of Resources to support teachers in integrating EE in Life Sciences lessons. The recommendation is that the DBE must provide all schools with EE-related recourses and follow up to see if those resources are used accordingly. This recommendation is influenced by the fact that resources are very essential to the integration of EE and that without them the integration of EE in Life Sciences is limited.
- This study finds that teachers do not integrate EE in their lessons because they are not trained. Hence, this study recommends that the DBE must organise yearly workshops to train teachers on how to integrate EE in Life Sciences.
- Teachers must take the responsibility to request for support rather than to blame the DBE on the lack of integration of EE in Life Sciences. This recommendation was influenced by the finding that showed that teachers only wait for the DBE to support them. This is because from this study there was no teacher who mentioned that he/she went to seek for support to integrate EE in Life Sciences from the DBE, but all teachers said that the DBE doest not support them in integrating EE in Life Sciences.

5.5 Contributions and Limitations of the study

This study contributes knowledge on how Life Sciences teachers who struggle to integrate EE into their lessons can be supported by the DBE to do so. This study also highlighted that Life Sciences teachers should read policy and other resources critically to receive support from them on how to integrate EE into their lessons. In this study, it was also pointed out that the DBE is not doing much in supporting teachers who fail to integrate EE into their lessons, and as a result, teachers do not regard the integration of EE as being necessary

This study looked at how Life Sciences teachers in the Vhembe District are supported to integrate EE into their lessons, thus, the study's one limitation was that it did not provide information for all school subjects, although, EE needs to be integrated across the curriculum. Also, the study focused on secondary schools only, not primary schools. There was limited time, and funds, hence, the study's focused on three secondary schools in Mutshindudi Circuit, Vhembe District in the Limpopo Province that were near each other. The results of this qualitative research would have been more dependable if the responses of participants where independently analyses by two or more individuals. By doing this would have assure consumers of the research (the DBE) that the results represent more than just the impression of the individual researcher which might be idiosyncratic. These limitations, however, do not reduce the relevance and quality of this study in anyway, but they open ways for future studies that might be taken under the same topic.

5.6 Closing comments

This chapter presented perspectives on the support for Life Sciences teachers in the Vhembe District to integrate EE into their lessons. The study found that there are relevant documents (textbooks and policy documents) that could be of support to teachers in this regard, however, the teachers do not benefit from such support because they do not read those documents very often. The subject advisor was found to be not supportive to teachers in integrating EE in their lessons. The subject advisor blamed the DBE, saying that its support is results-oriented with little attention on pedagogical content knowledge and integration of EE in Life Sciences. The advisor added that the DBE is under-resourced, which leads to lack of resources to help teachers to integrate EE into their lessons. The findings also showed that both the teachers and subject advisor lack a comprehensive understanding of what EE is.

Future studies may explore ways in which teachers can be encouraged to use the curriculum document to support themselves in the integration of EE into their lessons. Further research can explore the possibility of including EE sections in the assessment practices in schools and how those sections can be taught for learning rather than just for examination purposes.

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Appendix B: ethical certificate

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2018/06/13

Ref: 2018/06/13/57162522/40/MC
Name: Mr KR Munasi
Student: 57162522

Dear Mr Munasi

Decision: Ethics Approval from 2018/06/13 to 2021/06/13

Researcher(s): Name: Mr KR Munasi
E-mail address: 57162522@mylife.unisa.ac.za
Telephone: +27 79 035 4981

Supervisor(s): Name: Dr N Madikizela-Madiya
E-mail address: madiyn@unisa.ac.za
Telephone: +27 12 429 4698

Title of research:

Integrating Environmental Education in the curriculum of selected secondary school subjects in the Vhembe District

Qualification: M. Ed in Educational Foundations

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2018/06/13 to 2021/06/13.

*The **low risk** application was reviewed by the Ethics Review Committee on 2018/06/13 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the

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2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2021/06/13.** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2018/06/13/57162522/40/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Dr M Claassens
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Prof V McKay
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